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Table A-1. PM Sampling Schedule CA2B.

Start Date	End Date	Duration (days)		
		PM_{10}	TSP	$PM_{2.5}$
10/17/07	12/14/07	58.6	NS	NS
12/14/07	12/21/07	NS	7.0	NS
12/21/07	01/07/08	16.9	NS	NS
01/07/08	01/23/08	NS	NS	15.9
01/23/08	03/14/08	51.0	NS	NS
03/14/08	03/21/08	NS	7.0	NS
03/21/08	05/20/08	60.0	NS	NS
05/20/08	05/27/08	NS	6.9	NS
05/27/08	07/07/08	40.9	NS	NS
07/07/08	07/22/08	NS	NS	14.9
07/22/08	09/19/08	59.0	NS	NS
09/19/08	09/29/08	NS	10.1	NS
09/29/08	01/09/09	102.1	NS	NS
01/09/09	01/28/09	NS	NS	18.9
01/28/09	04/14/09	75.9	NS	NS
04/14/09	04/22/09	NS	7.9	NS
04/22/09	07/09/09	78.1	NS	NS
07/09/09	07/10/09	NS	0.9	NS
07/10/09	07/29/09	18.9	NS	NS
07/29/09	08/11/09	NS	12.9	NS
08/11/09	10/16/09	65.5	NS	NS

NS = Not sampled.

Table A-2. PM Sampling Schedule IN2H.

Start Date	Stop Date	Duration (days) H6			Duration (days) H7		
		PM_{10}	TSP	$PM_{2.5}$	PM_{10}	TSP	$PM_{2.5}$
05/09/07	07/03/07	54	NS	NS	NS	NS	NS
05/09/07	07/12/07	NS	NS	NS	63	NS	NS
07/03/07	07/12/07	NS	NS	9	NS	NS	NS
07/12/07	07/18/07	NS	NS	NS	NS	NS	6
07/12/07	09/13/07	61	NS	NS	NS	NS	NS
07/18/07	09/13/07	NS	NS	NS	55	NS	NS
09/13/07	09/19/07	NS	NS	6	NS	NS	6
09/19/07	11/08/07	49	NS	NS	49	NS	NS
11/08/07	11/20/07	NS	NS	12	NS	NS	12
11/20/07	01/01/08	41	NS	NS	41	NS	NS
01/01/08	01/31/08	30	NS	NS	NS	NS	NS
01/01/08	04/04/08	NS	NS	NS	93	NS	NS
01/31/08	02/08/08	NS	8	NS	NS	8	NS
02/08/08	04/04/08	56	NS	NS	NS	NS	NS
04/04/08	04/11/08	NS	7	NS	NS	7	NS
04/11/08	04/18/08	NS	NS	7	NS	NS	7
04/18/08	06/19/08	61	NS	NS	NS	NS	NS
04/18/08	12/12/08	NS	NS	NS	235	NS	NS
06/19/08	06/27/08	NS	8	NS	NS	NS	NS
06/27/08	12/12/08	165	NS	NS	NS	NS	NS
12/12/08	12/18/08	NS	6	NS	NS	6	NS
12/18/08	01/01/09	13	NS	NS	13	NS	NS
01/01/09	02/06/09	35	NS	NS	35	NS	NS
02/06/09	02/13/09	NS	7	NS	NS	7	NS
02/13/09	04/09/09	NS	NS	56	NS	NS	56
04/09/09	04/16/09	NS	7	NS	NS	7	NS
04/16/09	06/04/09	48	NS	NS	48	NS	NS
06/04/09	06/12/09	NS	8	NS	NS	8	NS
06/12/09	06/26/09	NS	NS	14	NS	NS	14
06/26/09	07/30/09	34	NS	NS	34	NS	NS

NS = Not sampled.

Table A-3. PM Sampling Schedule IN2B (houses and manure shed).

Start Date	End Date	Duration (days)		
		PM_{10}	TSP	$PM_{2.5}$
1/1/08	1/30/08	29	NS	NS
1/30/08	2/8/08	NS	8	NS
2/8/08	4/4/08	56	NS	NS
2/13/09	3/6/09	NS	NS	23
4/4/08	4/11/08	NS	7	NS
4/11/08	4/18/08	NS	NS	7
4/18/08	6/19/08	61	NS	NS
6/12/09	6/26/09	NS	NS	14
6/19/08	6/27/08	NS	8	NS
6/26/08	8/14/08	48	NS	NS
6/27/08	10/3/08	96	NS	NS
10/3/08	10/9/08	NS	6	NS
10/9/08	12/12/08	63	NS	NS
12/12/08	12/18/08	NS	6	NS
12/18/08	2/6/09	48	NS	NS
2/6/09	2/13/09	NS	7	NS
3/4/09	4/9/09	35	NS	NS
4/9/09	4/17/09	NS	8	NS
4/17/09	6/4/09	47	NS	NS
6/4/09	6/12/09	NS	8	NS
8/14/09	8/20/09	NS	6	NS
8/20/09	10/9/09	49	NS	NS
10/9/09	10/16/09	NS	7	NS
10/16/09	1/16/10	90	NS	NS

NS = Not sampled.

Table A-4. PM Sampling Schedule NC2B.

Start Date	Stop Date	Duration (days)		
		PM_{10}	TSP	$PM_{2.5}$
09/24/07	01/16/08	114.5	NS	NS
01/16/08	02/04/08	NS	NS	18.9
02/04/08	03/26/08	51.1	NS	NS
03/26/08	04/04/08	NS	9.1	NS
04/04/08	05/12/08	37.9	NS	NS
05/12/08	05/28/08	NS	16.0	NS
05/28/08	08/07/08	71.1	NS	NS
08/07/08	08/21/08	NS	14.0	NS
08/21/08	08/21/08	NS	20.9**	NS
08/21/08	09/11/08	20.9*	NS	NS
09/11/08	10/17/08	36.0	NS	NS
10/17/08	10/23/08	NS	5.8	NS
10/23/08	10/24/08	0.9	NS	NS
10/24/08	10/30/08	NS	NS	6.0
10/30/08	01/09/09	71.2	NS	NS
01/09/09	01/15/09	NS	5.8	NS
01/15/09	02/26/09	42.0	NS	NS
02/26/09	02/27/09	1§	NS	NS
02/27/09	03/04/09	NS	4.9§	NS
03/04/09	04/02/09	28.9§§	NS	NS
04/02/09	04/10/09	NS	8.0	NS
04/10/09	06/04/09	55.1	NS	NS
06/04/09	06/11/09	NS	7.0	NS
06/11/09	07/24/09	43.0	NS	NS
07/24/09	08/06/09	NS	NS	12.8
08/06/09	08/06/09	NS	NS	10.9**
08/06/09	08/07/09	1.0†	NS	NS
08/07/09	08/17/09	10.2*	NS	NS
08/17/09	08/20/09	2.9	NS	NS
08/20/09	08/27/09	NS	6.8	NS
08/27/09	09/15/09	19.2	NS	NS
09/15/09	09/15/09	20.9*	NS	NS
09/15/09	09/22/09	NS	6.8**	NS
09/22/09	10/06/09	14.2**	NS	NS

NS = Not sampled.; *All except inlet; **Only inlet
†Only H4 upstairs; ‡All except H3
§H4 TEOM collocated with H3
§§H3 TEOM relocated to H4 upstairs

Appendix B – Data Processing

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1.0 NEGATIVE EMISSION VALUE ASSESSMENT METHODOLOGY

Negative calculated emission values can occur in NAEMS datasets due to a range of different scenarios as described in the SAB review of the 2012 EEMs developed by EPA (U.S. EPA SAB, 2013). A summary of these scenarios and whether SAB recommended the data should be retained or removed is provided below:

1. A calculation bias may occur when measured values are at or close to the detection limit, or negative. This scenario should result in small negative values, which should be retained.

2. In NAEMS, the background and source measurements were measured either intermittently (twice a day for gas), or continuously without correction for lag time in the barn (PM data), thus leading to a bias either up or down, introducing the potential for negative emission values. Negative emission values should be retained because this bias could occur in either the positive or negative direction.

3. Outdoor events may affect background and barn concentrations. For example, if there was activity outside an animal barn which resulted in increased pollutant concentration (e.g., manure cleanout of another barn), the measured background values would create a negative bias. Alternatively, a positive bias could occur if meteorological conditions caused the barn exhaust air to return into the barn, thus affecting measured barn concentrations.

To avoid bias from the true value, the SAB suggests keeping calculated values from scenario 1 and 2 and removing values identified to be caused by scenario 3, however the NAEMS did not record outdoor events that may affect background concentration (scenario 3), therefore it could not be determined if negative emissions were caused by scenario 2 or 3. It is likely that scenarios 1 and 2 result in smaller negative (closer to zero) emissions than scenario 3. Therefore, a methodology was developed to remove large negative emissions likely associated with scenario 3. In the NAEMS QAPP, the gas and PM barn emission uncertainty were determined to be ±27% and ±32% for mechanically ventilated barns and ±50% and ±53% for naturally ventilated barns (Heber et al. 2008). Cut-offs for valid negative data were therefore determined for each pollutant by multiplying the emission uncertainty by the median of the positive measured emission values.

Table B-1. Summary of the effect of applying the negative emission cut-off to layer high rise data.

Pollutant	Median Positive Emission (kg d^{-1}/ g d^{-1})[a]	Uncertainty (%)	Negative Emission Cut-Off (kg d^{-1}/ g d^{-1})[a]	# Of Negative Emission Values		
				Before Cut-Off Applied	Removed Due To Cut-Off	After Cut-Off Applied
NH_3	55.19	27	-14.90	4	0	4
H_2S	51.78	27	-13.98	89	43	46
PM_{10}	1724.00	32	-551.68	54	22	32
$PM_{2.5}$	113.50	32	-36.32	65	50	15
TSP	3614.80	32	-1156.74	0	0	0

[a] NH_3 emissions in units of kg day^{-1}, all other pollutants in units of g day^{-1}

Table B-2. Summary of the effect of applying the negative emission cut-off to layer manure belt house data.

Pollutant	Median Positive Emission (kg d^{-1}/ g d^{-1})[a]	Uncertainty (%)	Negative Emission Cut-Off (kg d^{-1}/ g d^{-1})[a]	# Of Negative Emission Values		
				Before Cut-Off Applied	Removed Due To Cut-Off	After Cut-Off Applied
NH_3	59.67	27	-16.11	0	0	0
H_2S	440.89	27	-119.04	8	0	8
PM_{10}	3429.35	32	-1097.39	88	46	42
$PM_{2.5}$	343.2	32	-109.82	30	22	8
TSP	8769.45	32	-2806.22	1	0	1

[a] NH_3 emissions in units of kg day^{-1}, all other pollutants in units of g day^{-1}

Table B-3. Summary of the effect of applying the negative emission cut-off to layer manure shed data.

Pollutant	Median Positive Emission (kg d^{-1}/ g d^{-1})[a]	Uncertainty (%)	Negative Emission Cut-Off (kg d^{-1}/ g d^{-1})[a]	# Of Negative Emission Values		
				Before Cut-Off Applied	Removed Due To Cut-Off	After Cut-Off Applied
NH_3	2.82	50	-1.41	0	0	0
H_2S	19.28	50	-9.64	5	1	4
PM_{10}	103.16	53	-54.67	85	40	45
$PM_{2.5}$	15.41	53	-8.16	0	0	0
TSP	191.78	53	-101.64	3	1	2

[a] NH_3 emissions in units of kg day^{-1}, all other pollutants in units of g day^{-1}

2.0 REFERENCES

Heber A.J., Ni J-Q., Ramirez J.C., Schrock W., and Elkins J. 2008. Quality assurance project plan for the National Air Emissions Monitoring Study (barn component). Purdue University, West Lafayette, IN.

U.S. EPA Science Advisory Board (SAB), 2013. SAB Review of Emissions-Estimating Methodologies for Broiler Animal Feeding Operations and for Lagoons and Basins at Swine and Dairy Animal Feeding Operations, EPA-SAB-13-003.

Appendix C – Data Completeness

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Data Completeness Criteria for the Revised Data Set

The appropriate data completeness criteria to use in a study depends on the size of the dataset and the accuracy needed. A study by Grant et al. (2013), in which NH_3 emissions were modeled from swine lagoons based on NAEMS data, investigated data completeness and associated accuracy. The swine lagoon NH_3 emissions dataset had limited data availability at a data completeness of 75%. Grant et al. (2013) explored how much the data completeness criteria could be relaxed but still result in data with acceptable error. The study suggested an error of ±25% to be acceptable and determined that a daily data completeness of 52% (or 25 out of 48 30-minute periods) gave less than ±25% error (see Figure C-1). Using this relaxed daily completeness criteria resulted in a substantial increase in the size of the dataset.

Based on Figure C-1 from the Grant et al. (2013) study, it can be observed that a daily completeness criterion of 75% (36 out of 48 30-minute periods) would give an error of approximately 10%. If it is assumed that the relationship between data completeness and error from the Grant et al. (2013) study is representative of other NAEMS datasets, the effect of relaxed data completeness criteria can be investigated for other NAEMS sources.

The following sections examine the effect of a reduced data completeness criterion on the number of valid average daily means (ADM) for both the layer barns and manure shed, based on additional analysis completed by Heber that examined the effect of different completeness criteria by comparing the number of valid ADM.

EPA reviewed this data for the egg-layer sites and retained the 75% completeness criterion for all sites. The full analysis can be found in Appendix C.

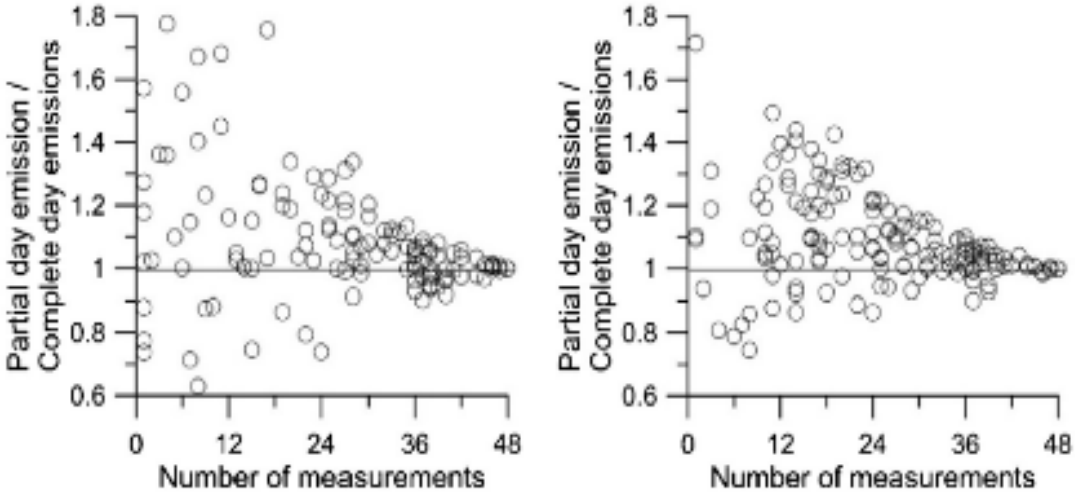

Figure C-1. Ratio of mean predicted emissions for portion of day with valid emissions measurements to mean predicted emissions for the complete day at the finishing (A) and sow (B) farm. Error plotted against number of valid 30-minute measurements (from Grant et al.

Data Completeness Review and Conclusions for the High Rise Dataset

The number of average daily means (ADM) for NH_3 emissions at varying percentages of data completeness for the revised data set are shown in Table C-1. For the layer high rise data set in this study, decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 230 (6.4%), but based on the Grant et al. (2013) study there would be an approximate 15% increase in error. Therefore, based on this analysis, a daily completeness criterion of 75% was chosen for the NH_3 layer high rise revised data set. This value matches the data completeness criteria used in the 2010 NAEMS data sets (Grant et al. 2008; Heber et al. 2008).

Table C-1. Number of ADM for high rise house NH_3 emissions at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2H-H6	680	677	671	663	648	628	608	579	564	558	335	335
IN2H-H7	687	684	679	668	655	638	616	588	570	558	374	374
CA2B-H5	606	606	601	601	596	591	581	578	570	567	564	470
CA2B-H6	628	625	618	618	613	607	602	596	590	585	580	412
NC2B-H3	690	690	683	682	678	673	665	645	638	629	614	410
NC2B-H4	684	684	675	674	667	664	656	647	639	629	616	392
Total	3,975	3,966	3,927	3,906	3,857	3,801	3,728	3,633	3,571	3,526	3,083	2,393

For H_2S, the number of ADM at varying percentages of data completeness for the revised data set are shown in Table C-2. For the high rise data set, decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 195 (5.8%), but based on the Grant et al. (2013) study there would be an approximate 15% increase in error. Since the small increase in the number of ADM values does not justify the 15% increase in error, a daily completeness criterion of 75% was chosen for the revised H_2S high rise data set.

Table C-2. Number of ADM for high rise house H_2S emissions at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2H-H6	482	479	474	470	460	447	434	413	401	398	248	248
IN2H-H7	489	486	482	475	470	458	445	426	410	401	264	264
CA2B-H5	646	635	630	630	627	622	610	607	601	597	594	495
CA2B-H6	676	654	648	648	644	638	631	625	620	614	610	466
NC2B-H3	713	713	709	708	702	698	688	670	662	656	650	444
NC2B-H4	706	706	701	700	693	689	680	669	663	654	650	423
Total	3,712	3,673	3,644	3,631	3,596	3,552	3,488	3,410	3,357	3,320	3,016	2,340

For PM, the number of ADM at varying percentages of data completeness for the revised data set are shown in Table C-3, Table C-4 and Table C-5 for PM_{10}, $PM_{2.5}$ and TSP, respectively. For the high rise site data set, decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 151 (5.4 %) for PM_{10}, 17 (10.5%) for $PM_{2.5}$ and 11 (5.0%) for TSP, respectively. Again, the small increase in the number of ADM values does not justify the 15% increase in error. Therefore, a daily completeness criterion of 75% was chosen for the all the PM species for high rise data set. This value also matches the data completeness criteria used in the 2010 NAEMS data sets (Heber et al. 2008).

Table C-3. Number of ADM for high rise house PM_{10} emissions at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2H-H6	489	484	479	472	462	451	439	423	417	404	200	200
IN2H-H7	479	476	472	465	458	450	443	425	421	409	222	222
CA2B-H5	492	492	487	487	482	467	457	454	451	450	439	347
CA2B-H6	593	592	581	581	575	559	539	531	527	525	501	306
NC2B-H3	450	450	448	446	442	429	423	411	410	406	391	283
NC2B-H4	603	603	601	596	587	572	565	555	551	547	532	328
Total	3,106	3,097	3,068	3,047	3,006	2,928	2,866	2,799	2,777	2,741	2,285	1,686

Table C-4. Number ADM for high rise house $PM_{2.5}$ emissions at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2H-H6	24	23	22	19	19	19	18	17	16	15	11	11
IN2H-H7	18	17	17	14	14	14	12	11	9	9	7	7
CA2B-H5	48	48	46	46	44	43	40	40	40	40	38	29
CA2B-H6	53	53	52	52	48	47	45	44	43	43	41	29
NC2B-H3	26	26	26	25	23	22	21	21	21	21	21	8
NC2B-H4	40	40	40	38	36	34	33	33	33	33	33	18
Total	209	207	203	194	184	179	169	166	162	161	151	102

Table C-5. Number of ADM for high rise house TSP emissions at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2H-H6	27	27	27	23	23	22	19	19	19	19	14	14
IN2H-H7	29	29	28	25	24	24	22	21	21	21	15	15
CA2B-H5	48	48	46	46	44	38	36	36	36	36	35	29
CA2B-H6	43	42	40	40	37	32	32	32	32	30	29	20
NC2B-H3	51	51	51	49	45	42	41	41	41	41	40	33
NC2B-H4	90	90	90	85	79	72	70	70	70	70	70	31
Total	288	287	282	268	252	230	220	219	219	217	203	142

Data Completeness Review and Conclusions for the Manure belt house Dataset

The number of ADM for NH_3 emissions at varying percentages of data completeness for the revised data set are shown in Table C-6. For the layer site data set, decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 95 (7.6%), but based on the Grant et al. (2013) study there would be an approximate 15% increase in error. Since the small increase in the number of ADM values does not justify the 15% increase in error, a daily completeness criterion of 75% was chosen for the revised NH_3 belted battery data set.

Table C-6. Number of manure belt house ADM for NH_3 at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2B H8	691	690	685	680	676	667	654	639	621	612	603	454
IN2B H9	695	694	690	687	684	678	663	646	629	618	609	462
Total	1,386	1,384	1,375	1,367	1,360	1,345	1,317	1,285	1,250	1,230	1,212	916

For H_2S, the number of ADM at varying percentages of data completeness for the revised data set are shown in Table C-7. For the belted battery data set, decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 90 (7.1%), but based on the Grant et al. (2013) study there would be an approximate 15% increase in error. Since the small increase in the number of ADM values does not justify the 15% increase in error, a daily completeness criterion of 75% was chosen for the revised H_2S belted battery data set.

Table C-7. Number of manure belt house ADM for H_2S at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2B H8	701	701	697	692	688	677	662	649	631	622	614	460
IN2B H9	705	705	702	700	697	689	675	658	645	633	623	473
Total	1,406	1,406	1,399	1,392	1,385	1,366	1,337	1,307	1,276	1,255	1,237	933

For PM_{10}, the number of ADM at varying percentages of data completeness for the revised data set are shown in Table C-8. For the manure belt house data set, decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 69 (9.8 %). The number of ADM for $PM_{2.5}$ are presented in Table C-9 and show the number of valid ADM would increase by 6 (10.7%). TSP (Table C-10) had an increase of 15 days (21.7%) when shifting to 50% completeness criteria. Again, the small increase in the number of ADM values does not justify the 15% increase in error. Therefore, a daily completeness criterion of 75% was chosen for all the PM species for the belted battery data set.

Table C-8. Number of manure belt house ADM for PM_{10} at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2B H8	433	429	422	409	393	381	367	354	346	339	300	160
IN2B H9	441	438	430	420	403	395	384	372	361	351	309	195
Total	874	867	852	829	796	776	751	726	707	690	609	355

Table C-9. Number of manure belt house ADM for $PM_{2.5}$ at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2B H8	30	29	29	29	29	28	25	25	25	25	24	16
IN2B H9	37	37	37	37	36	34	31	31	31	31	30	20
Total	67	66	66	66	65	62	56	56	56	56	54	36

Table C-10. Number of manure belt house ADM for TSP at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN2B H8	56	54	52	47	45	41	40	36	35	35	34	20
IN2B H9	56	54	51	47	45	43	41	36	34	34	33	22
Total	112	108	103	94	90	84	81	72	69	69	67	42

Data Completeness Review and Conclusions for Manure Shed Dataset

For the manure shed dataset (Table C-11), reducing the completeness criteria to 50% results in an additional 26 days (5%) for NH_3, 23 days (4.3%) for H_2S, 29 days (9.4%) for PM_{10}, 3 days (10%) for $PM_{2.5}$, and 4 days (16.7%) for TSP. These modest gains in the number of ADM available do not justify the estimated 15% increase in error.

Table C-11. Number of manure shed ADM for each pollutant at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
NH_3	588	561	554	552	545	544	531	526	518	506	502	394
H_2S	586	570	567	566	560	557	547	543	534	520	515	406
PM_{10}	368	367	365	355	342	336	321	312	307	295	267	183
$PM_{2.5}$	37	37	37	36	35	33	31	31	30	30	29	21
TSP	38	38	35	33	29	28	27	25	24	24	24	18

Appendix D: Summary Statistics

2024-09-18

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1 High Rise Houses

1.1 Emissions

1.1.1 Ammonia (NH_3)

Table D-1. NH_3 emission summary statistics for layer high rise houses (kg d^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	33.1	32.3	226	249	58.1	57.5
StdDev	17.4	29.8	88	100	20.9	24.4
Median	34.1	20.3	222	246	56.5	55.2
Minimum	2.1	2.0	37	39	8.6	1.2
Maximum	83.0	134.5	614	932	137.2	171.3
N	570.0	590.0	562	568	715.0	715.0
N>0	570.0	590.0	562	568	715.0	715.0
Q25	17.6	9.7	157	182	44.1	42.6
Q75	46.4	44.8	284	309	69.7	71.0
CV	52.6	92.3	39	40	35.9	42.4

Table D-2. NH_3 emission summary statistics for layer high rise houses (kg d^{-1} hd^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	0.96	0.96	1.04	1.22	0.61	0.64
StdDev	0.49	0.87	0.41	1.48	0.22	0.24
Median	0.99	0.62	1.01	1.14	0.60	0.60
Minimum	0.07	0.06	0.27	0.17	0.12	0.15
Maximum	2.34	3.95	3.21	30.75	1.45	1.85
N	570.00	590.00	560.00	564.00	702.00	665.00
N>0	570.00	590.00	560.00	564.00	702.00	665.00
Q25	0.54	0.30	0.74	0.83	0.47	0.49
Q75	1.34	1.34	1.31	1.41	0.74	0.77
CV	51.32	90.57	39.44	121.02	35.34	36.77

1.1.2 Hydrogen Sulfide (H_2S)

Table D-3. H_2S emission summary statistics for layer high rise houses (g d^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	46	40.06	317.9	289	58	63
StdDev	24	29.68	272.1	273	35	43
Median	44	31.48	275.5	205	48	50
Minimum	-14	0.31	-4.1	-13	-12	-14
Maximum	125	144.55	1920.2	1840	230	311
N	600	619.00	384.0	390	699	699
N<0	11	0.00	3.0	4	8	20
Q25	31	19.38	129.0	92	34	37
Q75	62	50.39	432.4	408	74	77
CV	53	74.08	85.6	95	61	69

Table D-4. H_2S emission summary statistics for layer high rise houses (mg d^{-1} hd^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	1.34	1.21	1.45	1.32	0.61	0.69
StdDev	0.71	0.88	1.21	1.31	0.36	0.44
Median	1.29	0.95	1.24	0.97	0.50	0.53
Minimum	-0.40	0.01	-0.02	-0.06	-0.05	-0.08
Maximum	3.80	4.99	8.77	11.83	2.37	3.22
N	600.00	619.00	382.00	390.00	689.00	652.00
N<0	11.00	0.00	3.00	4.00	3.00	1.00
Q25	0.91	0.58	0.64	0.45	0.35	0.42
Q75	1.83	1.56	1.98	1.85	0.79	0.86
CV	52.95	73.29	83.47	98.65	59.43	63.04

1.1.3 Particulate Matter (PM_{10})

Table D-5. PM_{10} emission summary statistics for layer high rise houses (g d^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	1273	963	4073	4953	1523	2200
StdDev	1022	793	2929	3983	636	1130
Median	935	713	3329	3438	1481	2016
Minimum	-15	-362	-492	-444	-197	-296
Maximum	8139	4690	14674	24934	5243	9382
N	451	526	390	417	383	565
N<0	1	7	3	4	3	4
Q25	612	383	2277	2239	1106	1365
Q75	1678	1385	4986	6501	1806	2940
CV	80	82	72	80	42	51

Table D-6. PM_{10} emission summary statistics for layer high rise houses (mg d^{-1} hd^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	37.56	30	18.8	27.2	16.2	24.0
StdDev	30.33	27	13.3	94.0	6.2	11.6
Median	27.45	21	15.3	15.3	15.6	21.8
Minimum	-0.42	-11	-2.1	-5.1	2.8	1.6
Maximum	230.76	276	66.2	1895.3	53.7	98.3
N	451.00	524	388.0	414.0	369.0	537.0
N<0	1.00	6	3.0	4.0	0.0	0.0
Q25	17.90	11	10.2	9.9	11.9	15.4
Q75	49.77	42	23.4	30.4	18.7	31.8
CV	80.74	90	71.1	345.8	38.0	48.4

1.1.4 Particulate Matter ($PM_{2.5}$)

Table D-7. $PM_{2.5}$ emission summary statistics for layer high rise houses (g d^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	252.0	207.1	207	102	56.68	171
StdDev	540.9	347.8	254	23	33.07	150
Median	-7.4	-2.4	129	104	52.47	92
Minimum	-35.8	-23.0	46	56	0.57	-28
Maximum	1890.3	1146.1	1112	129	97.98	471
N	38.0	37.0	16	9	18.00	44
N<0	27.0	19.0	0	0	0.00	3
Q25	-19.8	-8.8	99	88	29.05	69
Q75	1.7	389.4	204	118	87.35	280
CV	214.7	167.9	123	23	58.34	88

Table D-8. $PM_{2.5}$ emission summary statistics for layer high rise houses (mg d^{-1} hd^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	7.08	6.37	0.98	0.44	0.59	1.99
StdDev	15.22	10.68	1.25	0.10	0.35	1.61
Median	-0.21	-0.07	0.56	0.45	0.55	1.47
Minimum	-1.04	-0.68	0.20	0.24	0.01	-0.29
Maximum	53.15	35.17	5.43	0.56	1.01	5.06
N	38.00	37.00	16.00	9.00	18.00	39.00
N<0	27.00	19.00	0.00	0.00	0.00	1.00
Q25	-0.57	-0.26	0.43	0.38	0.30	0.80
Q75	0.05	11.98	0.93	0.51	0.91	3.43
CV	214.97	167.64	128.47	22.54	58.30	81.04

1.1.5 Total Suspended Particulates (TSP)

Table D-9. TSP emission summary statistics for layer high rise houses (g d^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	2437	2765	7803	4652	3434	4147.9
StdDev	1383	1455	2805	3740	1515	2428.9
Median	2168	2413	7142	3768	3296	4414.7
Minimum	178	1241	4613	658	983	-5.6
Maximum	5954	7412	15093	13311	7758	16620.1
N	36	32	19	21	45	87.0
N<0	0	0	0	0	0	2.0
Q25	1334	1733	5794	1269	2327	2922.9
Q75	3597	3081	9208	6562	4740	5298.0
CV	57	53	36	80	44	58.6

Table D-10. TSP emission summary statistics for layer high rise houses (mg d^{-1} hd^{-1}).

Statistic	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Mean	71.9	84	38	21.9	35	51
StdDev	41.0	44	15	17.7	16	22
Median	62.5	73	34	17.8	34	49
Minimum	5.4	37	20	2.9	10	20
Maximum	177.2	226	68	62.0	81	180
N	36.0	32	19	21.0	45	74
N>0	36.0	32	19	21.0	45	74
Q25	39.8	53	27	6.0	24	39
Q75	105.0	94	46	31.1	48	60
CV	57.0	53	39	80.6	44	42

1.2 Environmental

Table D-11. Environmental parameter summary statistics for layer high rise houses.

Parameter	Stat	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Inventory (hd)	Mean	33103.659	32160.672	218158.226	218847.775	93403.785	89377.734
Inventory (hd)	StdDev	6032.199	5963.760	21556.810	20610.535	14057.810	19925.122
Inventory (hd)	Median	34223.000	33183.000	221708.000	221097.000	95448.750	93065.507
Inventory (hd)	Minimum	0.000	0.000	0.000	0.000	0.000	0.000
Inventory (hd)	Maximum	35675.000	34697.000	232157.000	232382.000	97995.000	97346.001
Inventory (hd)	N	731.000	731.000	730.000	728.000	822.000	813.000
Inventory (hd)	Q25	33365.000	32640.500	213297.250	214671.000	94241.627	91615.502
Inventory (hd)	Q75	35036.500	33859.500	228828.500	229518.500	96803.252	96050.001
Inventory (hd)	CV	0.182	0.185	0.099	0.094	0.151	0.223
Average Weight (kg)	Mean	1.661	1.587	1.441	1.456	1.518	1.467
Average Weight (kg)	StdDev	0.127	0.119	0.062	0.085	0.094	0.053
Average Weight (kg)	Median	1.710	1.630	1.460	1.470	1.506	1.491
Average Weight (kg)	Minimum	1.260	1.250	1.230	1.210	1.207	1.211
Average Weight (kg)	Maximum	1.810	1.720	1.600	1.600	1.678	1.588
Average Weight (kg)	N	707.000	706.000	723.000	727.000	805.000	776.000
Average Weight (kg)	Q25	1.640	1.560	1.430	1.410	1.469	1.429
Average Weight (kg)	Q75	1.750	1.660	1.470	1.510	1.560	1.505
Average Weight (kg)	CV	0.077	0.075	0.043	0.058	0.062	0.036
Live animal weight	Mean	55092.425	51131.606	316317.699	318424.453	141782.720	130992.279
Live animal weight	StdDev	10831.617	10205.980	24541.930	31468.140	22884.013	29180.991
Live animal weight	Median	57424.080	54072.440	317443.630	323738.235	142494.478	137546.590
Live animal weight	Minimum	0.000	0.000	0.000	0.000	0.000	0.000
Live animal weight	Maximum	64075.810	59195.520	347358.000	355361.820	160364.602	142885.305
Live animal weight	N	729.000	729.000	724.000	728.000	822.000	813.000
Live animal weight	Q25	55099.030	50705.150	306780.180	319624.957	140713.307	135337.374
Live animal weight	Q75	60133.860	55100.380	329054.670	327951.020	146678.290	138732.908
Live animal weight	CV	0.197	0.200	0.078	0.099	0.161	0.223
Exhaust Temperatures (C)	Mean	22.329	22.302	22.325	22.526	24.632	24.431
Exhaust Temperatures (C)	StdDev	3.283	3.359	3.691	3.672	2.772	3.101
Exhaust Temperatures (C)	Median	22.400	22.300	22.450	22.600	24.688	24.599
Exhaust Temperatures (C)	Minimum	15.000	13.400	9.800	8.500	13.505	11.085
Exhaust Temperatures (C)	Maximum	28.600	29.100	30.000	30.700	31.723	31.368
Exhaust Temperatures (C)	N	719.000	719.000	700.000	700.000	816.000	811.000
Exhaust Temperatures (C)	Q25	19.800	19.900	19.400	19.900	22.854	22.375
Exhaust Temperatures (C)	Q75	25.300	25.250	25.400	25.300	26.496	26.569
Exhaust Temperatures (C)	CV	0.147	0.151	0.165	0.163	0.113	0.127
Exhaust Relative Humidity (%)	Mean	57.916	60.811	48.715	51.585	68.401	68.264

Parameter	Stat	CA2BH5	CA2BH6	IN2HH6	IN2HH7	NC2BH3	NC2BH4
Exhaust Relative Humidity (%)	StdDev	6.629	8.491	5.511	6.147	7.759	7.903
Exhaust Relative Humidity (%)	Median	57.900	60.300	48.500	52.200	69.175	69.105
Exhaust Relative Humidity (%)	Minimum	37.200	36.900	31.800	34.500	43.875	45.730
Exhaust Relative Humidity (%)	Maximum	75.300	82.700	65.500	66.900	85.469	86.168
Exhaust Relative Humidity (%)	N	695.000	704.000	700.000	699.000	811.000	811.000
Exhaust Relative Humidity (%)	Q25	53.650	54.675	45.400	47.500	63.272	62.865
Exhaust Relative Humidity (%)	Q75	62.900	67.125	51.900	55.800	74.079	73.992
Exhaust Relative Humidity (%)	CV	0.114	0.140	0.113	0.119	0.113	0.116
Airflow (dsm^3s^{-1})	Mean	47.762	46.222	176.373	183.894	109.155	111.905
Airflow (dsm^3s^{-1})	StdDev	20.667	21.188	162.184	174.513	93.246	92.688
Airflow (dsm^3s^{-1})	Median	45.987	46.088	92.168	93.476	65.208	73.445
Airflow (dsm^3s^{-1})	Minimum	15.632	12.238	13.420	32.221	1.767	15.279
Airflow (dsm^3s^{-1})	Maximum	86.803	102.829	657.948	675.837	278.299	281.632
Airflow (dsm^3s^{-1})	N	642.000	672.000	657.000	575.000	812.000	803.000
Airflow (dsm^3s^{-1})	Q25	27.944	26.258	50.839	54.062	25.568	28.591
Airflow (dsm^3s^{-1})	Q75	65.385	64.435	270.286	282.461	200.592	199.578
Airflow (dsm^3s^{-1})	CV	0.433	0.458	0.920	0.949	0.854	0.828

1.3 Ambient

Table D-12. Summary of ambient meteorological parameters for layer high rise houses.

Parameter	Stat	CA2B	IN2H	NC2B
Ambient Temperature (C)	Mean	17.49	12.05	16.51
Ambient Temperature (C)	StdDev	6.86	11.55	8.34
Ambient Temperature (C)	Median	17.10	13.50	17.23
Ambient Temperature (C)	Minimum	3.70	-24.30	-5.63
Ambient Temperature (C)	Maximum	32.10	29.80	31.81
Ambient Temperature (C)	N	731.00	731.00	811.00
Ambient Temperature (C)	Q25	11.90	2.05	9.90
Ambient Temperature (C)	Q75	23.60	22.80	24.04
Ambient Temperature (C)	CV	0.39	0.96	0.51
Ambient Relative Humidity (%)	Mean	58.82	68.21	70.59
Ambient Relative Humidity (%)	StdDev	12.73	13.32	14.20
Ambient Relative Humidity (%)	Median	57.60	67.80	70.74
Ambient Relative Humidity (%)	Minimum	31.40	34.60	27.92
Ambient Relative Humidity (%)	Maximum	91.40	97.80	100.00
Ambient Relative Humidity (%)	N	661.00	668.00	816.00
Ambient Relative Humidity (%)	Q25	48.60	57.88	61.04
Ambient Relative Humidity (%)	Q75	68.60	79.00	80.69
Ambient Relative Humidity (%)	CV	0.22	0.20	0.20

2 Belted Houses

2.1 Emissions

2.1.1 Ammonia (NH_3)

Table D-13. NH_3 emission summary statistics for layer manure belt houses (kg d^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	72	67.0
StdDev	38	43.0
Median	62	57.5
Minimum	10	1.5
Maximum	294	414.6
N	621	629.0
N>0	621	629.0
Q25	46	42.6
Q75	85	77.2
CV	52	64.1

Table D-14. NH_3 emission summary statistics for layer manure belt houses (kg d^{-1} hd^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	0.29	0.29
StdDev	0.15	0.26
Median	0.25	0.24
Minimum	0.04	0.02
Maximum	1.16	4.93
N	621.00	627.00
N>0	621.00	627.00
Q25	0.19	0.18
Q75	0.35	0.32
CV	51.61	90.28

2.1.2 Hydrogen Sulfide (H_2S)

Table D-15. H_2S emission summary statistics for layer manure belt houses (g d^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	492	471
StdDev	246	268
Median	440	432
Minimum	65	-59
Maximum	2164	1916
CV	50	57
N<0	0	8
Q25	342	292
Q75	595	625

Table D-16. H_2S emission summary statistics for layer manure belt houses (mg d^{-1} hd^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	1.96	1.9
StdDev	0.94	1.2
Median	1.77	1.8
Minimum	0.26	-11.0
Maximum	8.32	7.6
N	631.00	643.0
N<0	0.00	8.0
N>0	631.00	635.0
Q25	1.39	1.2
Q75	2.34	2.5
CV	47.89	65.2

2.1.3 Particulate Matter (PM_{10})

Table D-17. PM_{10} emission summary statistics for layer manure belt houses (g d^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	3464	6782
StdDev	4756	8158
Median	1772	4292
Minimum	-1041	-1043
Maximum	33225	66503
N	232	334
N<0	21	21
N>0	211	313
Q25	646	1849
Q75	4505	8308
CV	137	120

Table D-18. PM_{10} emission summary statistics for layer manure belt houses (mg d^{-1} hd^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	13.9	27.7
StdDev	19.1	32.9
Median	7.2	18.2
Minimum	-4.3	-4.3
Maximum	135.9	269.3
N	232.0	334.0
N<0	21.0	21.0
N>0	211.0	313.0
Q25	2.8	7.7
Q75	18.2	36.7
CV	137.0	118.6

2.1.4 Particulate Matter ($PM_{2.5}$)

Table D-19. $PM_{2.5}$ emission summary statistics for layer manure belt houses (g d^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	514	208
StdDev	519	221
Median	548	150
Minimum	-102	-106
Maximum	1388	688
N	11	23
N<0	3	5
N>0	8	18
Q25	17	70
Q75	765	343
CV	101	106

Table D-20. $PM_{2.5}$ emission summary statistics for layer manure belt houses (mg d^{-1} hd^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	2.06	0.84
StdDev	2.08	0.89
Median	2.20	0.61
Minimum	-0.42	-0.43
Maximum	5.57	2.75
N	11.00	23.00
N<0	3.00	5.00
N>0	8.00	18.00
Q25	0.07	0.28
Q75	3.06	1.39
CV	101.17	105.89

2.1.5 Total Suspended Paticulates (TSP)

Table D-21. TSP emission summary statistics for layer manure belt houses (g d^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	8136	21871
StdDev	5867	22338
Median	8301	13407
Minimum	-695	12
Maximum	28130	92287
N	35	34
N<0	1	0
N>0	34	34
Q25	4436	6452
Q75	10691	29007
CV	72	102

Table D-22. TSP emission summary statistics for layer manure belt houses (mg d^{-1} hd^{-1}).

Statistic	IN2BH8	IN2BH9
Mean	33.3	88.78
StdDev	24.5	91.28
Median	32.9	53.99
Minimum	-2.9	0.05
Maximum	118.0	379.10
N	35.0	34.00
N<0	1.0	0.00
N>0	34.0	34.00
Q25	17.8	25.46
Q75	43.6	118.55
CV	73.5	102.81

2.2 Environmental

Table D-23. Environmental parameter summary statistics for layer manure belt houses.

Parameter	Stat	IN2BH8	IN2BH9
Inventory (hd)	Mean	250110.53	241817.32
Inventory (hd)	StdDev	10256.47	29660.67
Inventory (hd)	Median	253110.00	246430.00
Inventory (hd)	Minimum	228650.00	0.00
Inventory (hd)	Maximum	262610.00	256970.00
Inventory (hd)	N	731.00	731.00
Inventory (hd)	Q25	241595.00	242190.00
Inventory (hd)	Q75	259280.00	249765.00
Inventory (hd)	CV	0.04	0.12
Average Weight (kg)	Mean	1.42	1.41
Average Weight (kg)	StdDev	0.05	0.08
Average Weight (kg)	Median	1.43	1.42
Average Weight (kg)	Minimum	1.20	1.15
Average Weight (kg)	Maximum	1.52	1.53
Average Weight (kg)	N	731.00	710.00
Average Weight (kg)	Q25	1.40	1.37
Average Weight (kg)	Q75	1.45	1.47
Average Weight (kg)	CV	0.04	0.06
Live animal weight (kg)	Mean	354622.32	347102.79
Live animal weight (kg)	StdDev	16692.23	28267.95
Live animal weight (kg)	Median	359758.00	347754.95
Live animal weight (kg)	Minimum	300096.00	0.00
Live animal weight (kg)	Maximum	382432.40	377625.00
Live animal weight (kg)	N	731.00	712.00
Live animal weight (kg)	Q25	341676.00	337637.55
Live animal weight (kg)	Q75	366252.60	366739.20
Live animal weight (kg)	CV	0.05	0.08
Exhaust Temperatures (C)	Mean	26.84	26.47
Exhaust Temperatures (C)	StdDev	2.04	2.46
Exhaust Temperatures (C)	Median	27.05	26.60
Exhaust Temperatures (C)	Minimum	20.00	14.90
Exhaust Temperatures (C)	Maximum	31.00	31.20
Exhaust Temperatures (C)	N	712.00	712.00
Exhaust Temperatures (C)	Q25	25.60	25.20
Exhaust Temperatures (C)	Q75	28.40	28.40
Exhaust Temperatures (C)	CV	0.08	0.09
Exhaust Relative Humidity (%)	Mean	58.23	64.41
Exhaust Relative Humidity (%)	StdDev	6.02	7.84
Exhaust Relative Humidity (%)	Median	58.40	64.55
Exhaust Relative Humidity (%)	Minimum	40.90	43.50
Exhaust Relative Humidity (%)	Maximum	78.30	83.60
Exhaust Relative Humidity (%)	N	651.00	712.00
Exhaust Relative Humidity (%)	Q25	54.25	58.20

Parameter	Stat	IN2BH8	IN2BH9
Exhaust Relative Humidity (%)	Q75	62.40	69.80
Exhaust Relative Humidity (%)	CV	0.10	0.12
Airflow (dsm^3s^{-1})	Mean	129.53	127.11
Airflow (dsm^3s^{-1})	StdDev	91.54	88.67
Airflow (dsm^3s^{-1})	Median	91.45	91.33
Airflow (dsm^3s^{-1})	Minimum	9.62	19.70
Airflow (dsm^3s^{-1})	Maximum	542.30	561.77
Airflow (dsm^3s^{-1})	N	628.00	632.00
Airflow (dsm^3s^{-1})	Q25	67.41	66.53
Airflow (dsm^3s^{-1})	Q75	170.82	159.57
Airflow (dsm^3s^{-1})	CV	0.71	0.70

2.3 Ambient

Table D-24. Summary of ambient meteorological parameters for layer manure belt houses.

Parameter	Stat	IN2B
Ambient Temperature (C)	Mean	11.84
Ambient Temperature (C)	StdDev	10.89
Ambient Temperature (C)	Median	12.90
Ambient Temperature (C)	Minimum	-18.40
Ambient Temperature (C)	Maximum	29.60
Ambient Temperature (C)	count	693.00
Ambient Temperature (C)	Q25	2.50
Ambient Temperature (C)	Q75	21.90
Ambient Temperature (C)	CV	0.92
Ambient Relative Humidity (%)	Mean	69.17
Ambient Relative Humidity (%)	StdDev	12.93
Ambient Relative Humidity (%)	Median	69.40
Ambient Relative Humidity (%)	Minimum	34.60
Ambient Relative Humidity (%)	Maximum	97.80
Ambient Relative Humidity (%)	count	674.00
Ambient Relative Humidity (%)	Q25	60.02
Ambient Relative Humidity (%)	Q75	78.85
Ambient Relative Humidity (%)	CV	0.19

3 Manure Sheds

3.1 Emissions

3.1.1 Ammonia (NH_3)

Table D-25. NH_3 emission summary statistics for layer manure sheds (kg d^{-1}).

Statistic	IN2BMS
Mean	4.74
StdDev	6.52
Median	2.82
Minimum	-0.21
Maximum	88.37
N	518.00
N<0	1.00
Q25	1.39
Q75	5.26
CV	137.35

Table D-26. NH_3 emission summary statistics for layer manure sheds (kg d^{-1} hd^{-1}).

Statistic	IN2BMS
Mean	0.01
StdDev	0.01
Median	0.01
Minimum	0.00
Maximum	0.18
N	518.00
N<0	1.00
N>0	517.00
Q25	0.00
Q75	0.01
CV	135.03

3.1.2 Hydrogen Sulfide (H_2S)

Table D-27. H_2S emission summary statistics for layer manure sheds (g d^{-1}).

Statistic	IN2BMS
Mean	36.0
StdDev	52.4
Median	19.2
Minimum	-4.4
Maximum	528.2
N	533.0
N<0	4.0
N>0	529.0
Q25	10.2
Q75	40.5
CV	145.7

Table D-28. H_2S emission summary statistics for layer manure sheds (mg d^{-1} hd^{-1}).

Statistic	IN2BMS
Mean	0.07
StdDev	0.11
Median	0.04
Minimum	-0.01
Maximum	1.05
N	533.00
N<0	4.00
N>0	529.00
Q25	0.02
Q75	0.08
CV	144.74

3.1.3 Particulate Matter (PM_{10})

Table D-29. PM_{10} emission summary statistics for layer manure sheds (g d^{-1}).

Statistic	IN2BMS
Mean	181
StdDev	297
Median	83
Minimum	-32
Maximum	2557
N	256
N<0	34
N>0	222
Q25	26
Q75	208
CV	164

Table D-30. PM_{10} emission summary statistics for layer manure sheds (mg d^{-1} hd^{-1}).

Statistic	IN2BMS
Mean	0.37
StdDev	0.60
Median	0.18
Minimum	-0.07
Maximum	5.01
N	256.00
N<0	34.00
N>0	222.00
Q25	0.05
Q75	0.43
CV	161.63

3.1.4 Particulate Matter ($PM_{2.5}$)

Table D-31. $PM_{2.5}$ emission summary statistics for layer manure sheds (g d^{-1}).

Statistic	IN2BMS
Mean	48.3
StdDev	74.2
Median	15.4
Minimum	3.2
Maximum	320.5
N	30.0
N>0	30.0
Q25	8.1
Q75	59.0
CV	153.8

Table D-32. $PM_{2.5}$ emission summary statistics for layer manure sheds (mg d^{-1} hd^{-1}).

Statistic	IN2BMS
Mean	0.10
StdDev	0.15
Median	0.03
Minimum	0.01
Maximum	0.63
N	30.00
N>0	30.00
Q25	0.02
Q75	0.12
CV	151.76

3.1.5 Total Suspended Paticulates (TSP)

Table D-33. TSP emission summary statistics for layer manure sheds (g d^{-1}).

Statistic	IN2BMS
Mean	317
StdDev	408
Median	180
Minimum	-28
Maximum	1763
N	23
N<0	2
Q25	62
Q75	382
CV	128

Table D-34. TSP emission summary statistics for layer manure sheds (mg d^{-1} hd^{-1}).

Statistic	IN2BMS
Mean	0.66
StdDev	0.84
Median	0.37
Minimum	-0.06
Maximum	3.60
N	23.00
N<0	2.00
N>0	21.00
Q25	0.12
Q75	0.78
CV	128.14

3.2 Environmental

Table D-35. Environmental parameter summary statistics for layer manure sheds.

Parameter	Stat	IN2BMS
Inventory (hd)	Mean	491927.85
Inventory (hd)	StdDev	31413.57
Inventory (hd)	Median	498340.00
Inventory (hd)	Minimum	256320.00
Inventory (hd)	Maximum	519580.00
Inventory (hd)	N	731.00
Inventory (hd)	Q25	484370.00
Inventory (hd)	Q75	505415.00
Inventory (hd)	CV	0.06
Average Weight (kg)	Mean	1.41
Average Weight (kg)	StdDev	0.04
Average Weight (kg)	Median	1.43
Average Weight (kg)	Minimum	1.25
Average Weight (kg)	Maximum	1.47
Average Weight (kg)	N	712.00
Average Weight (kg)	Q25	1.39
Average Weight (kg)	Q75	1.45
Average Weight (kg)	CV	0.03
Live animal weight (kg)	Mean	701478.59
Live animal weight (kg)	StdDev	36029.59
Live animal weight (kg)	Median	704602.80
Live animal weight (kg)	Minimum	363974.40
Live animal weight (kg)	Maximum	755783.00
Live animal weight (kg)	N	712.00
Live animal weight (kg)	Q25	677600.82
Live animal weight (kg)	Q75	730963.12
Live animal weight (kg)	CV	0.05

3.3 Ambient

Table D-36. Summary of ambient meteorological parameters for layer manure sheds.

Parameter	Stat	IN2B
Ambient Temperature (C)	Mean	11.84
Ambient Temperature (C)	StdDev	10.89
Ambient Temperature (C)	Median	12.90
Ambient Temperature (C)	Minimum	-18.40
Ambient Temperature (C)	Maximum	29.60
Ambient Temperature (C)	count	693.00
Ambient Temperature (C)	Q25	2.50
Ambient Temperature (C)	Q75	21.90
Ambient Temperature (C)	CV	0.92
Ambient Relative Humidity (%)	Mean	69.17
Ambient Relative Humidity (%)	StdDev	12.93
Ambient Relative Humidity (%)	Median	69.40
Ambient Relative Humidity (%)	Minimum	34.60
Ambient Relative Humidity (%)	Maximum	97.80
Ambient Relative Humidity (%)	count	674.00
Ambient Relative Humidity (%)	Q25	60.02
Ambient Relative Humidity (%)	Q75	78.85
Ambient Relative Humidity (%)	CV	0.19

Appendix E: Time Series

2024-09-16

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1 High Rise Houses

1.1 Emissions

1.1.1 Ammonia (NH_3)

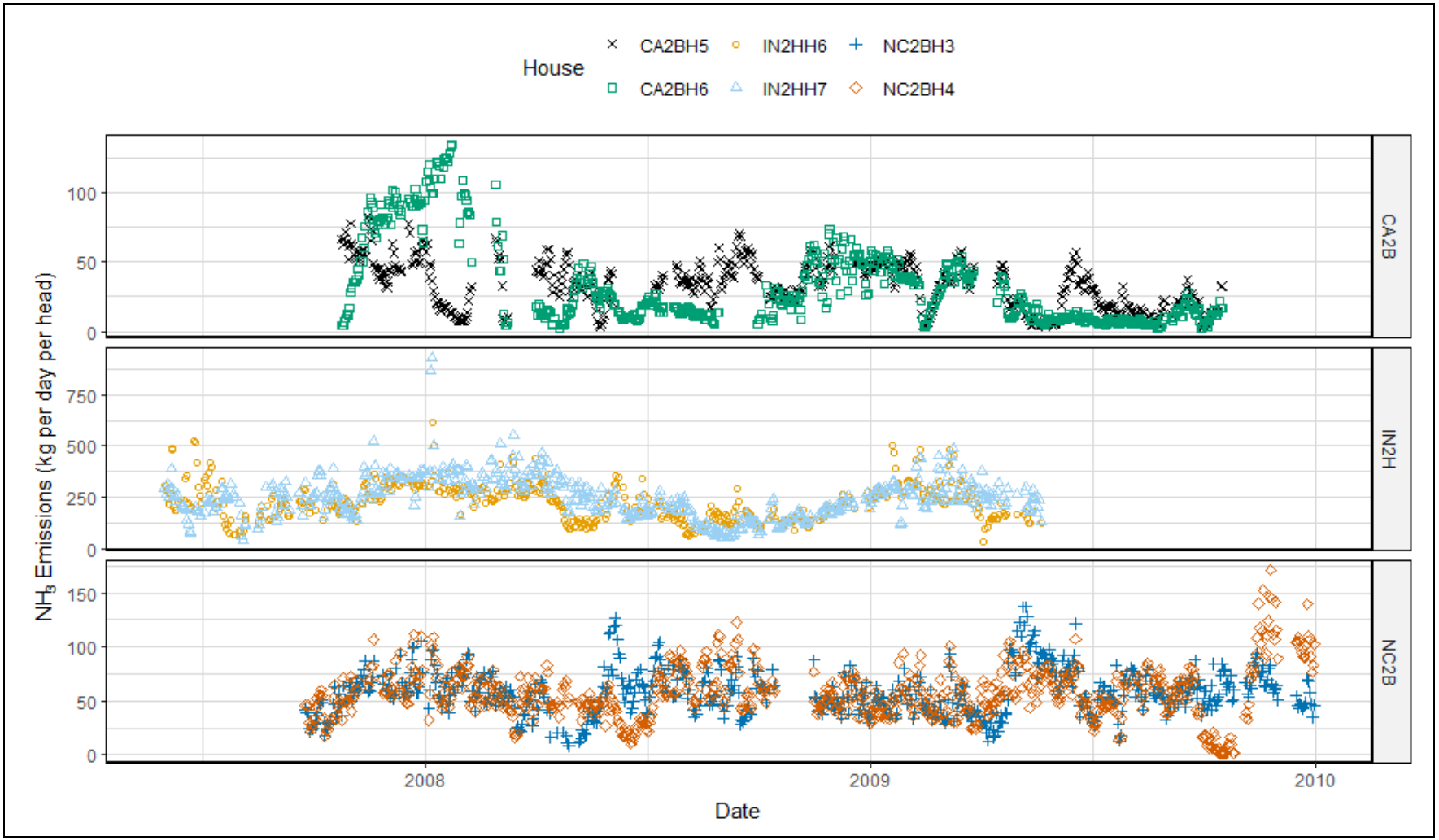

Figure E-1. NH_3 emission time series for layer high rise house (kg d^{-1}).

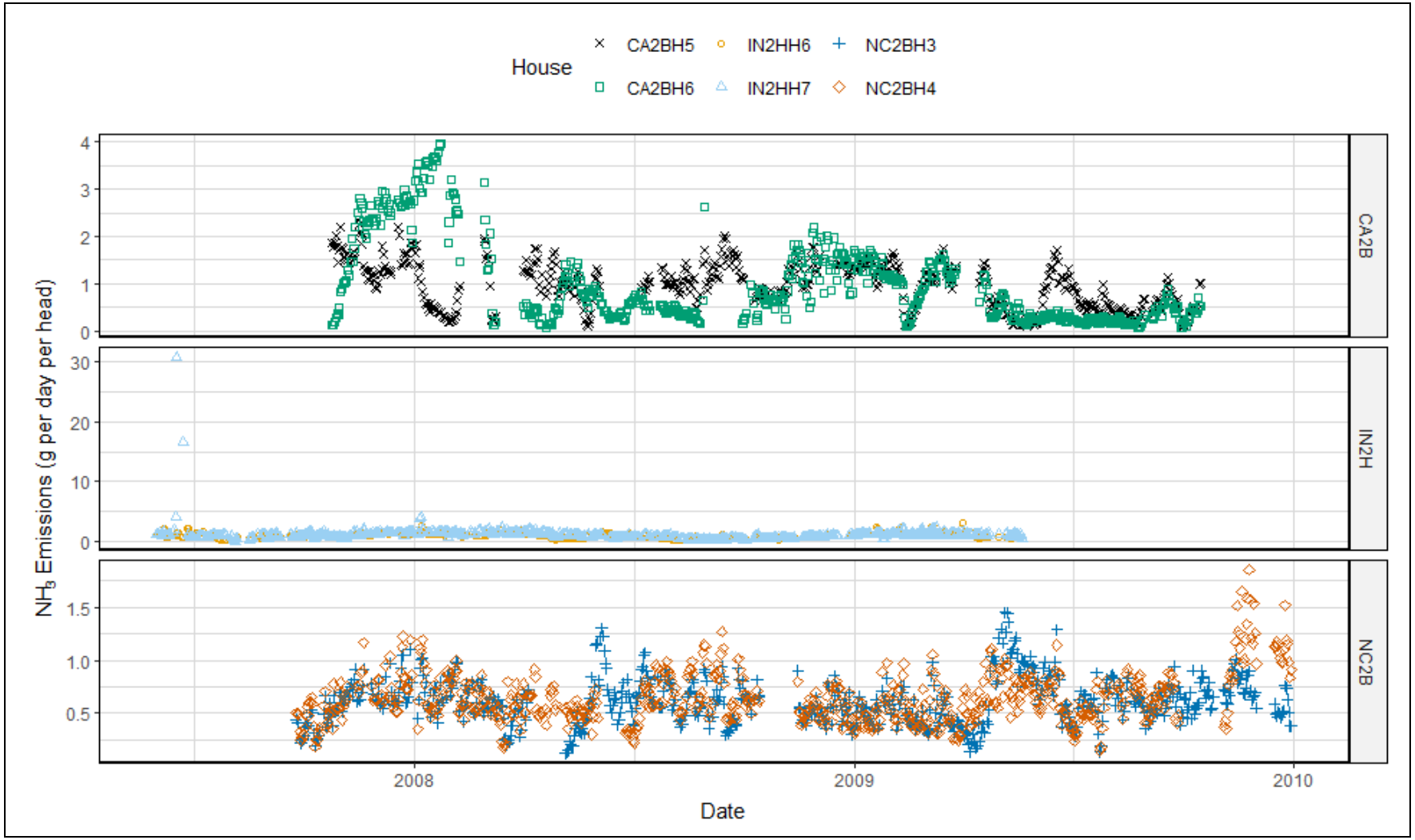

Figure E-2. NH_3 emission time series for layer high rise house (g $d^{-1}hd^{-1}$).

1.1.2 Hydrogen Sulfide (H_2S)

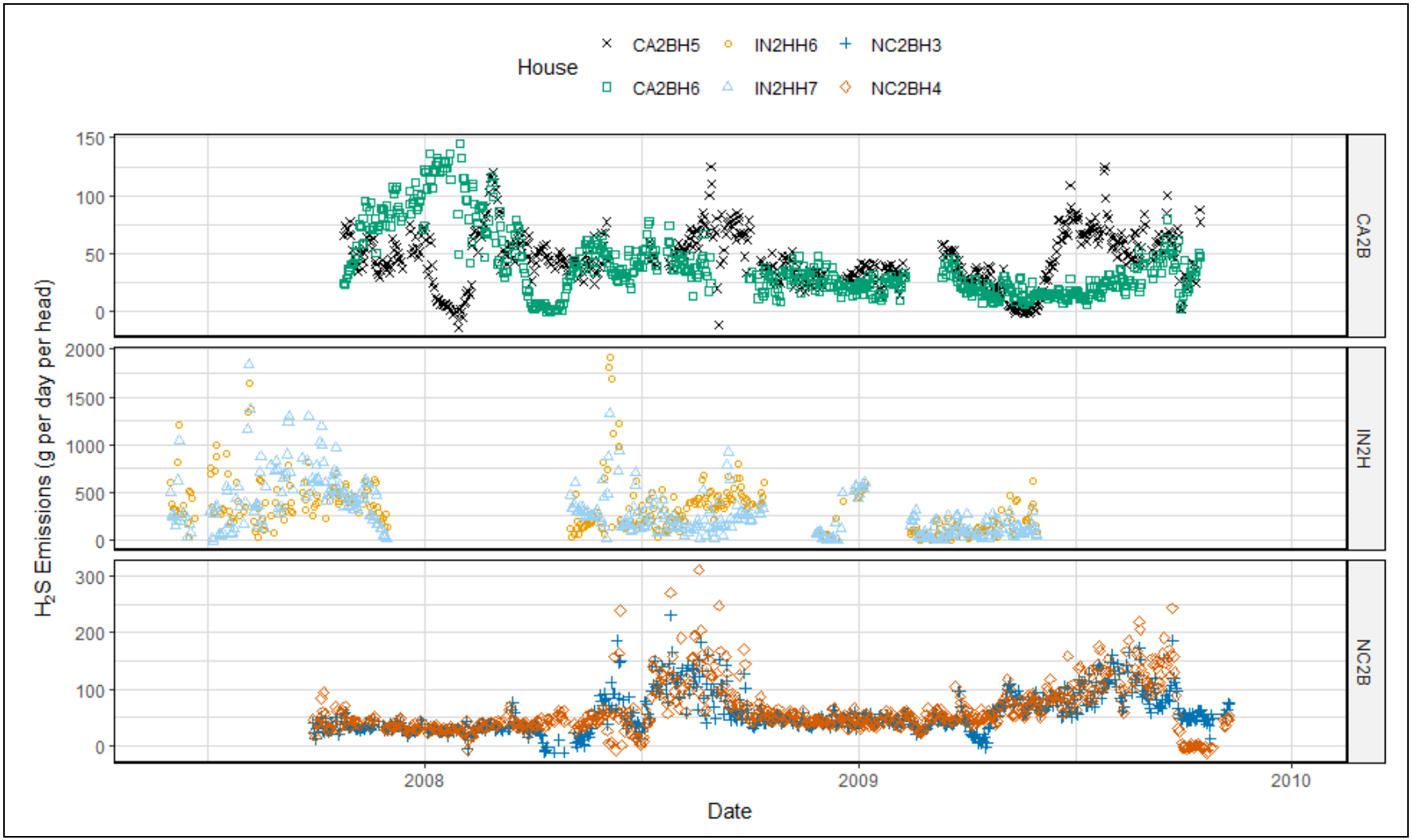

Figure E-3. H_2S emission time series for layer high rise house (g d^{-1}).

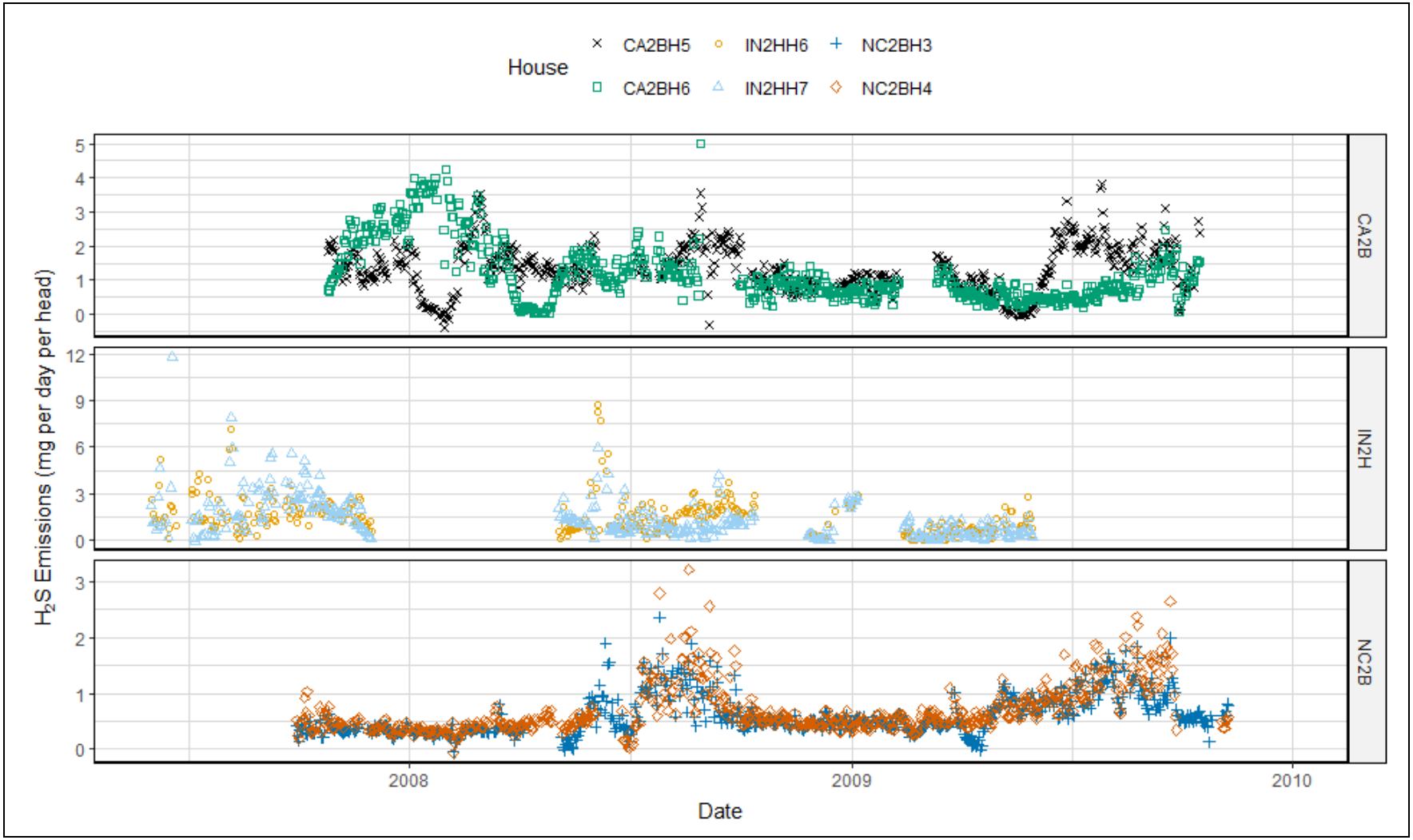

Figure E-4. H_2S emission time series for layer high rise house (mg $d^{-1}hd^{-1}$).

1.1.3 Particulate Matter (PM_{10})

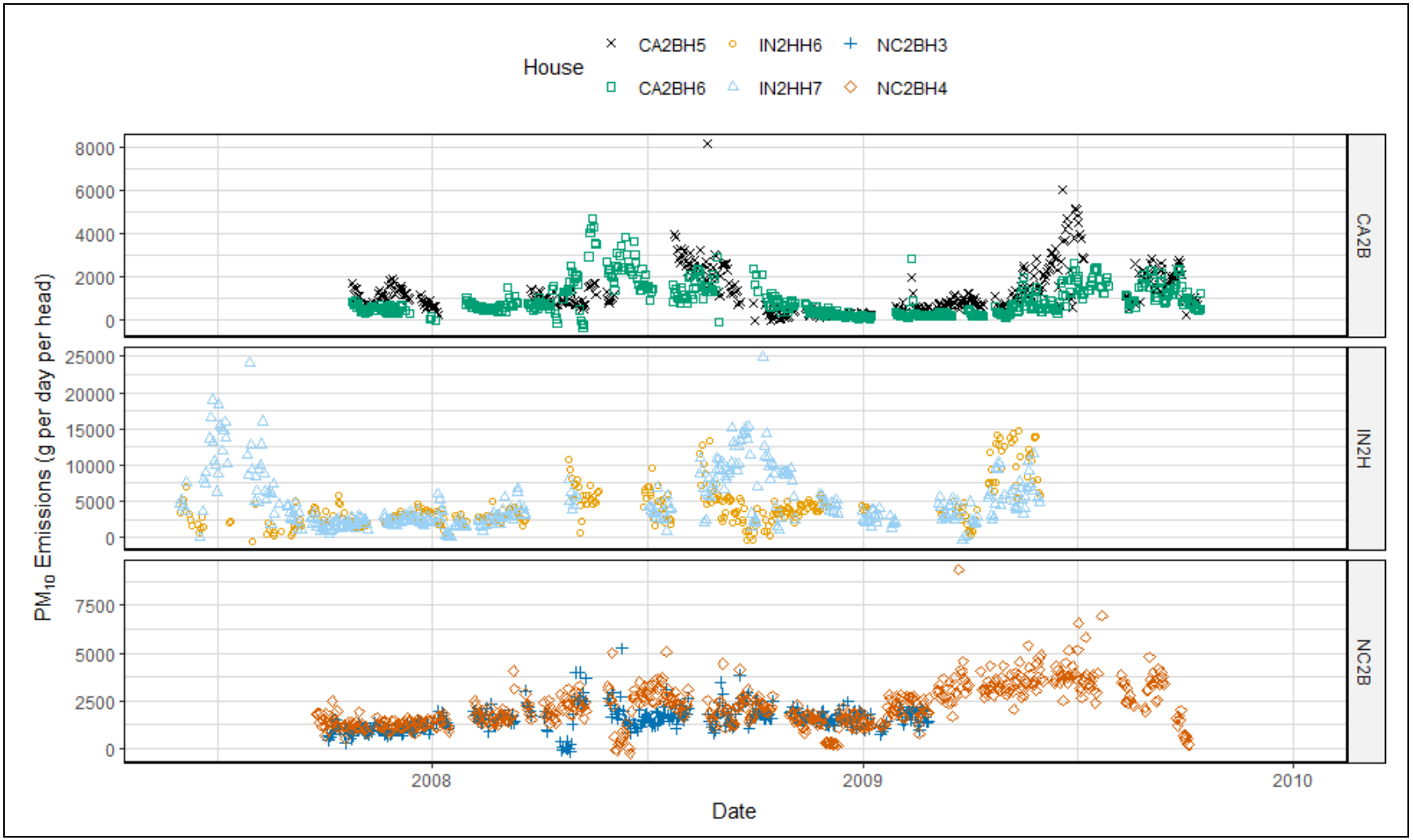

Figure E-5. PM_{10} emission time series for layer high rise house (g d^{-1}).

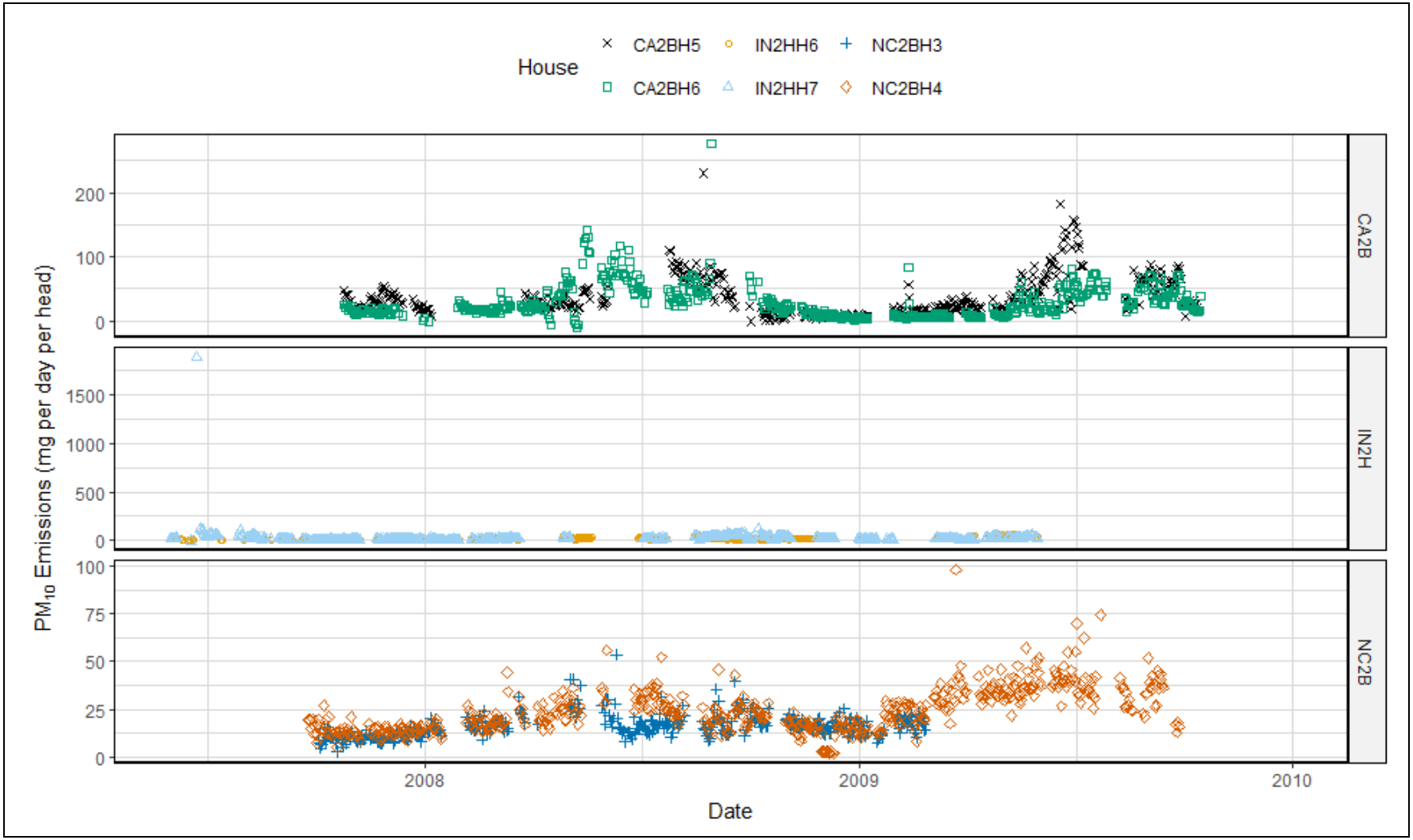

Figure E-6. PM_{10} emission time series for layer high rise house (mg $d^{-1}hd^{-1}$).

1.1.4 Particulate Matter ($PM_{2.5}$)

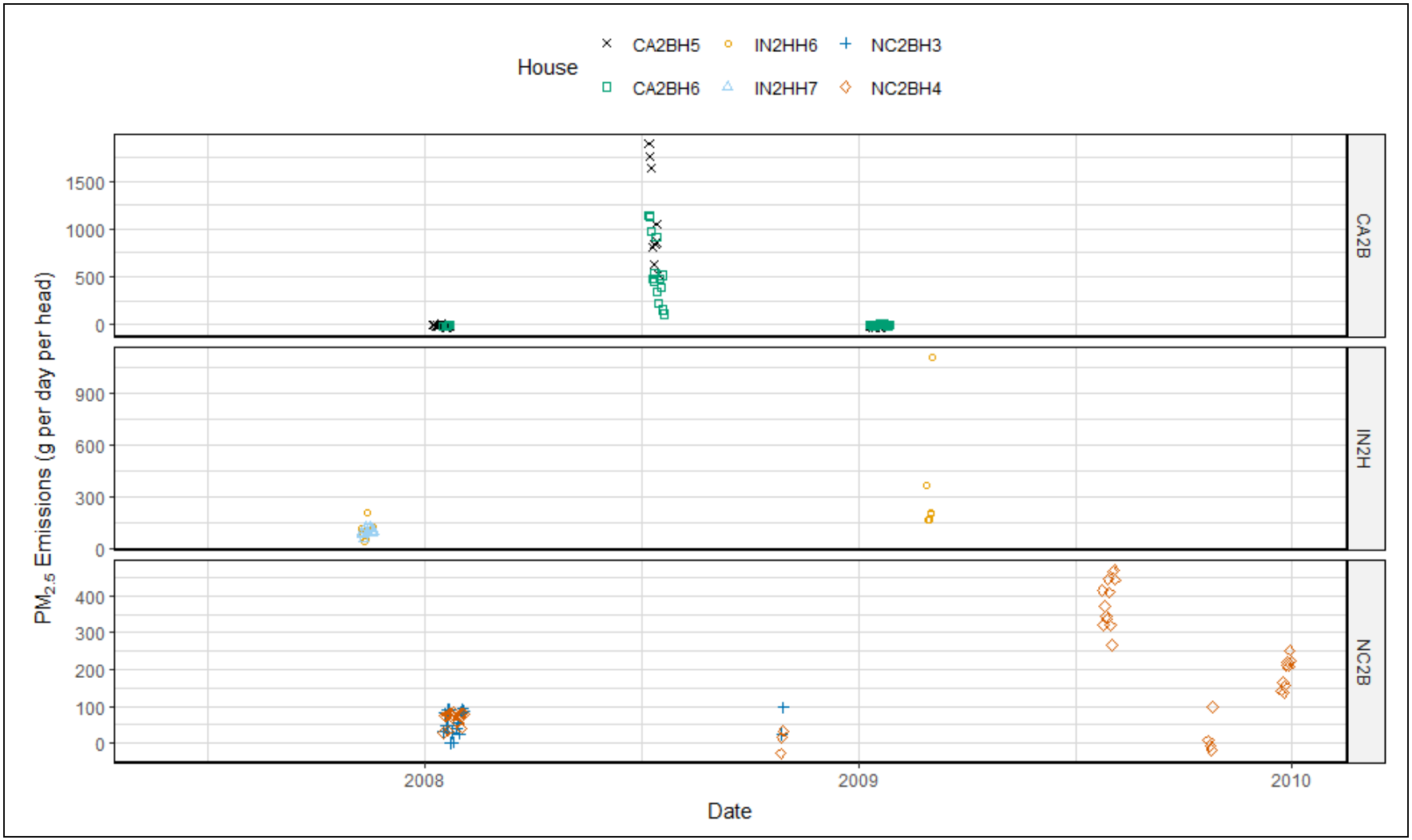

Figure E-7. $PM_{2.5}$ emission time series for layer high rise house (g d^{-1}).

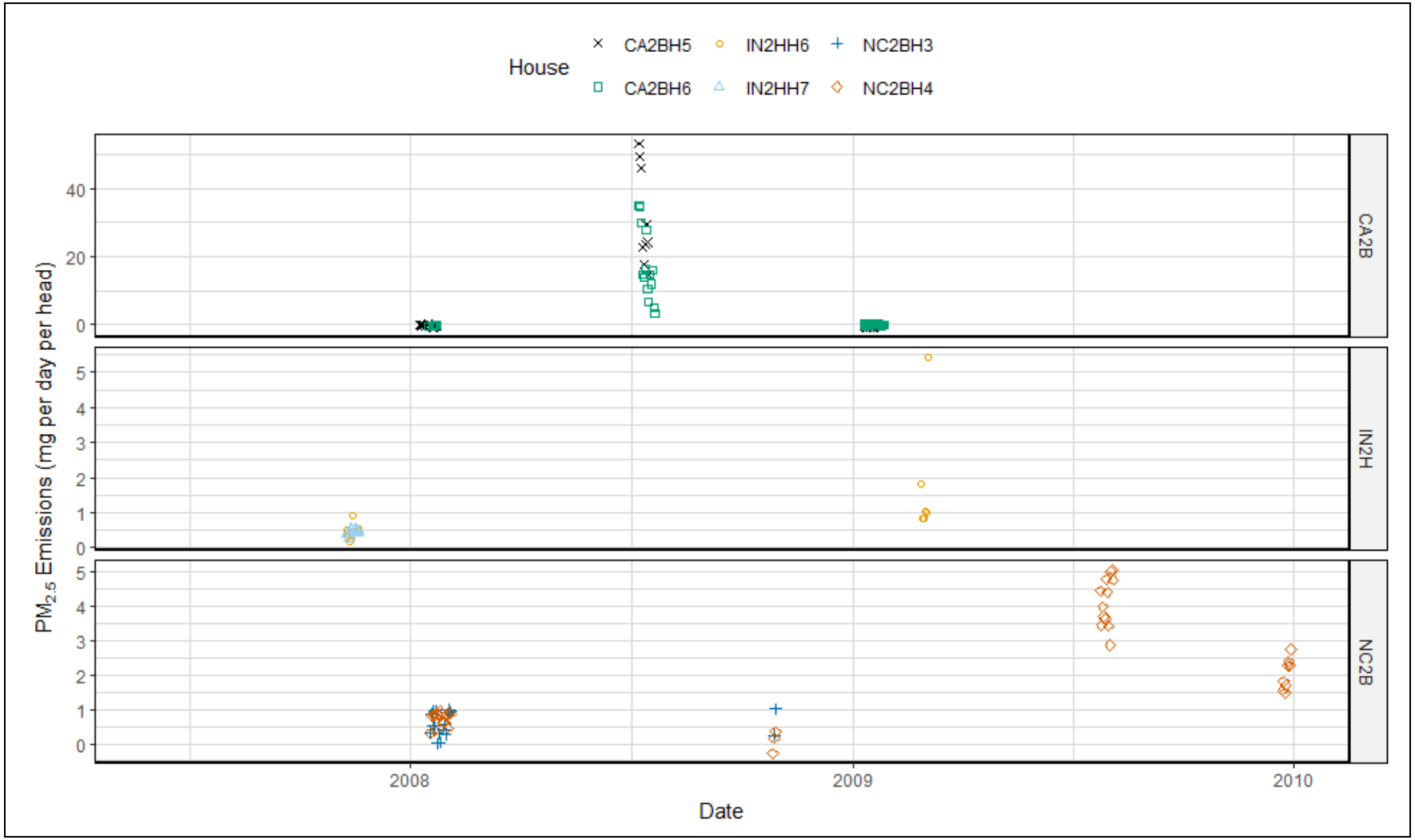

Figure E-8. $PM_{2.5}$ emission time series for layer high rise house (mg $d^{-1}hd^{-1}$).

1.1.5 Total Suspended Paticulates (TSP)

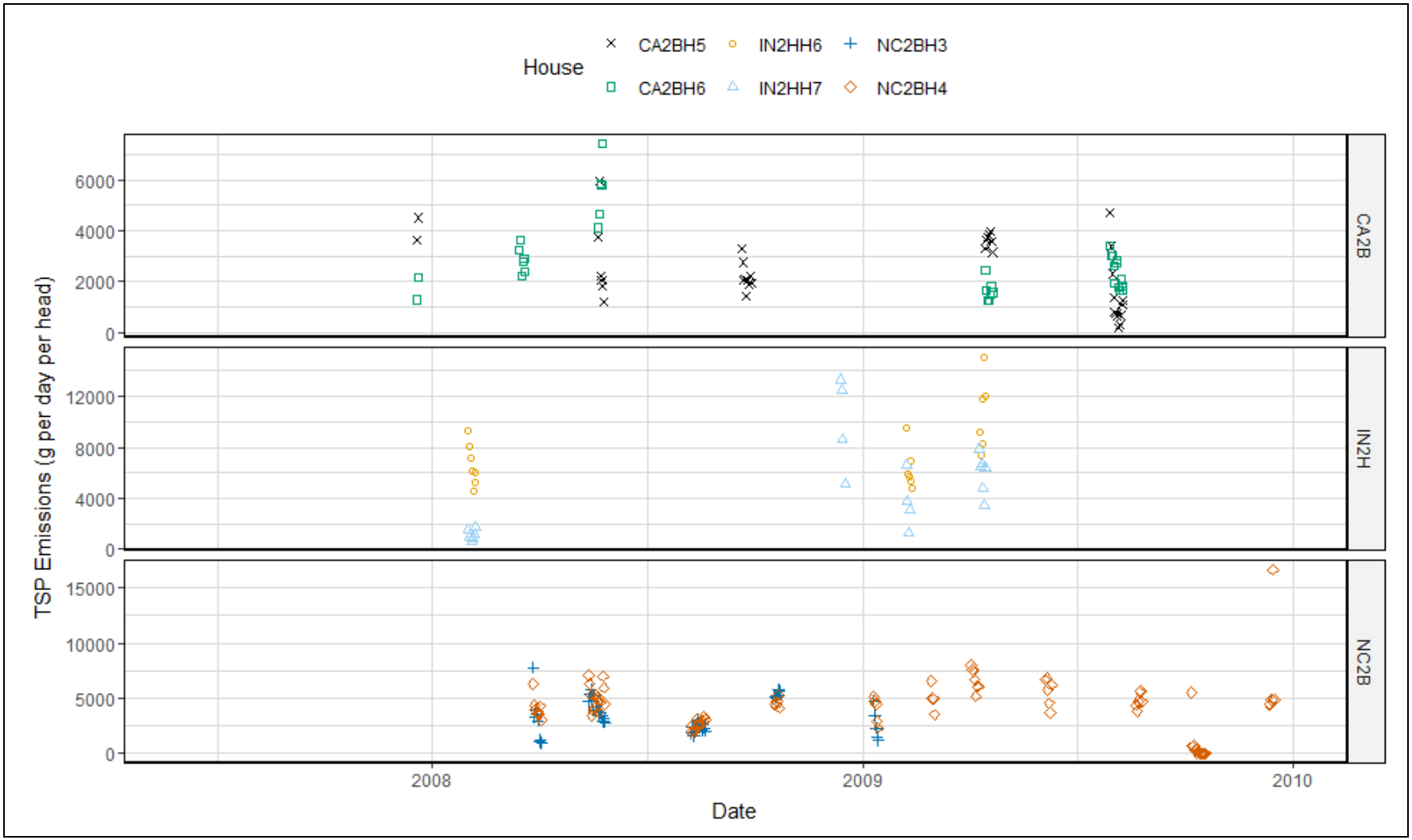

Figure E-9. TSP emission time series for layer high rise house (g d^{-1}).

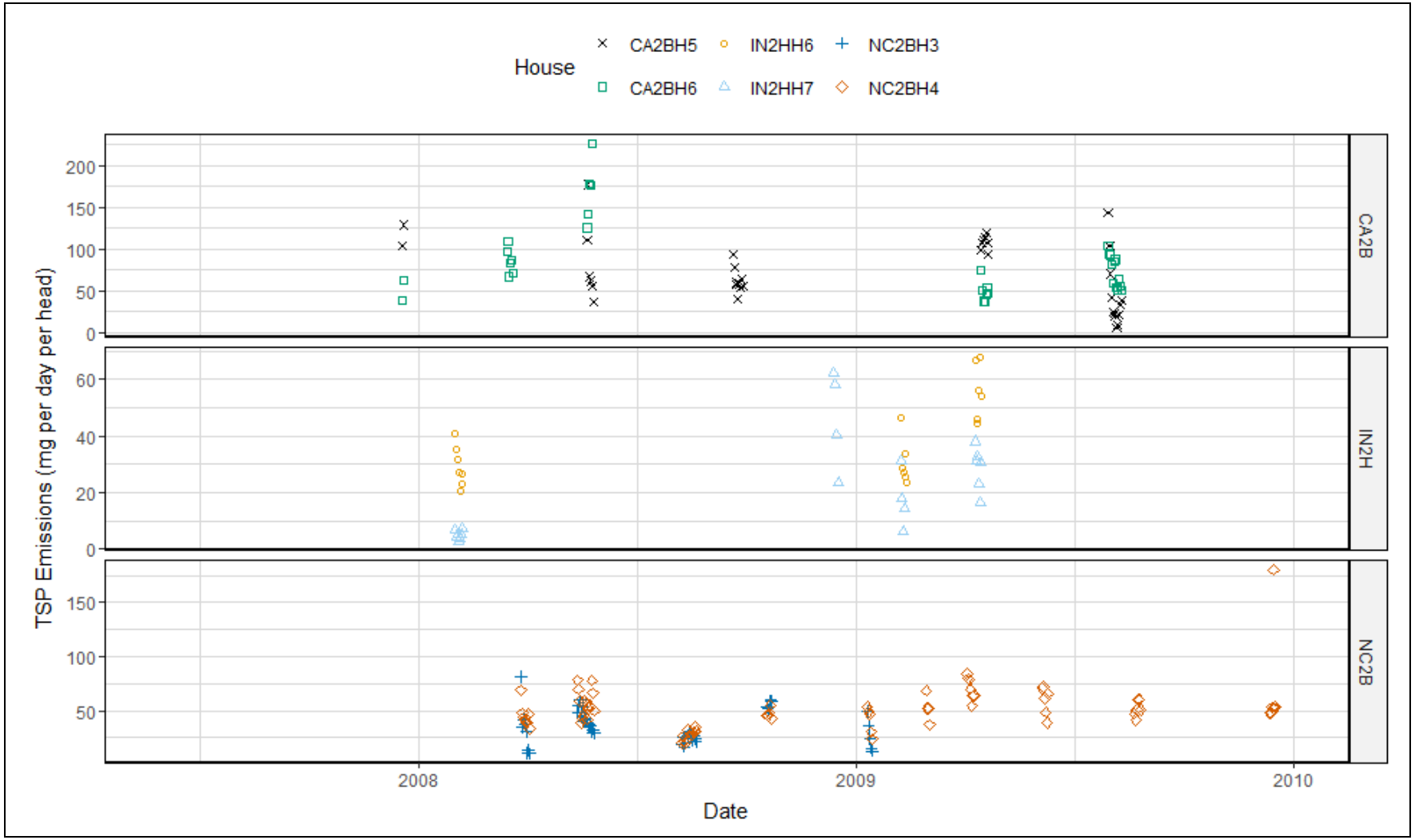

Figure E-10. TSP emission time series for layer high rise house (mg $d^{-1}hd^{-1}$).

1.2 Environmental

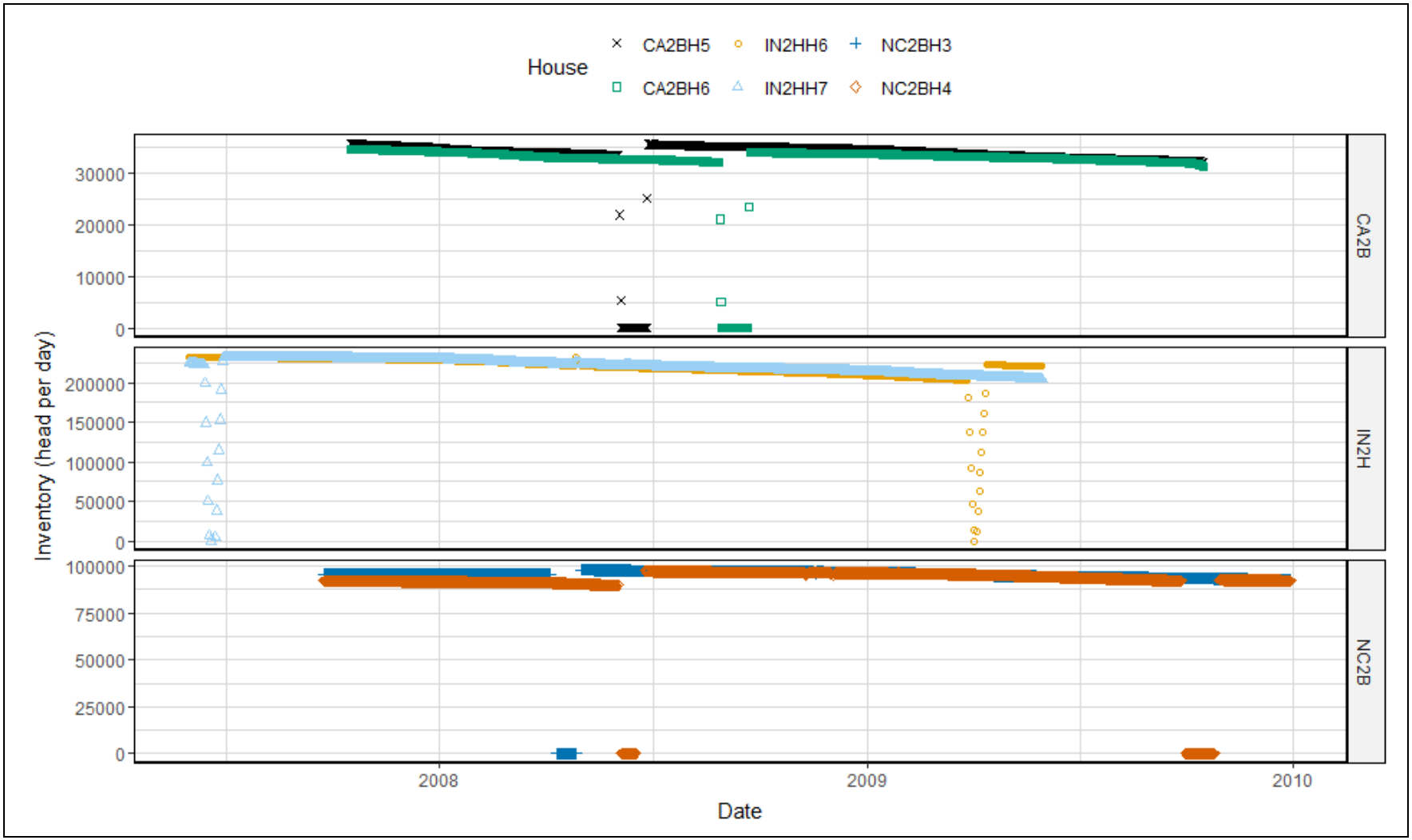

Figure E-11. Inventory time series for layer high rise house (hd).

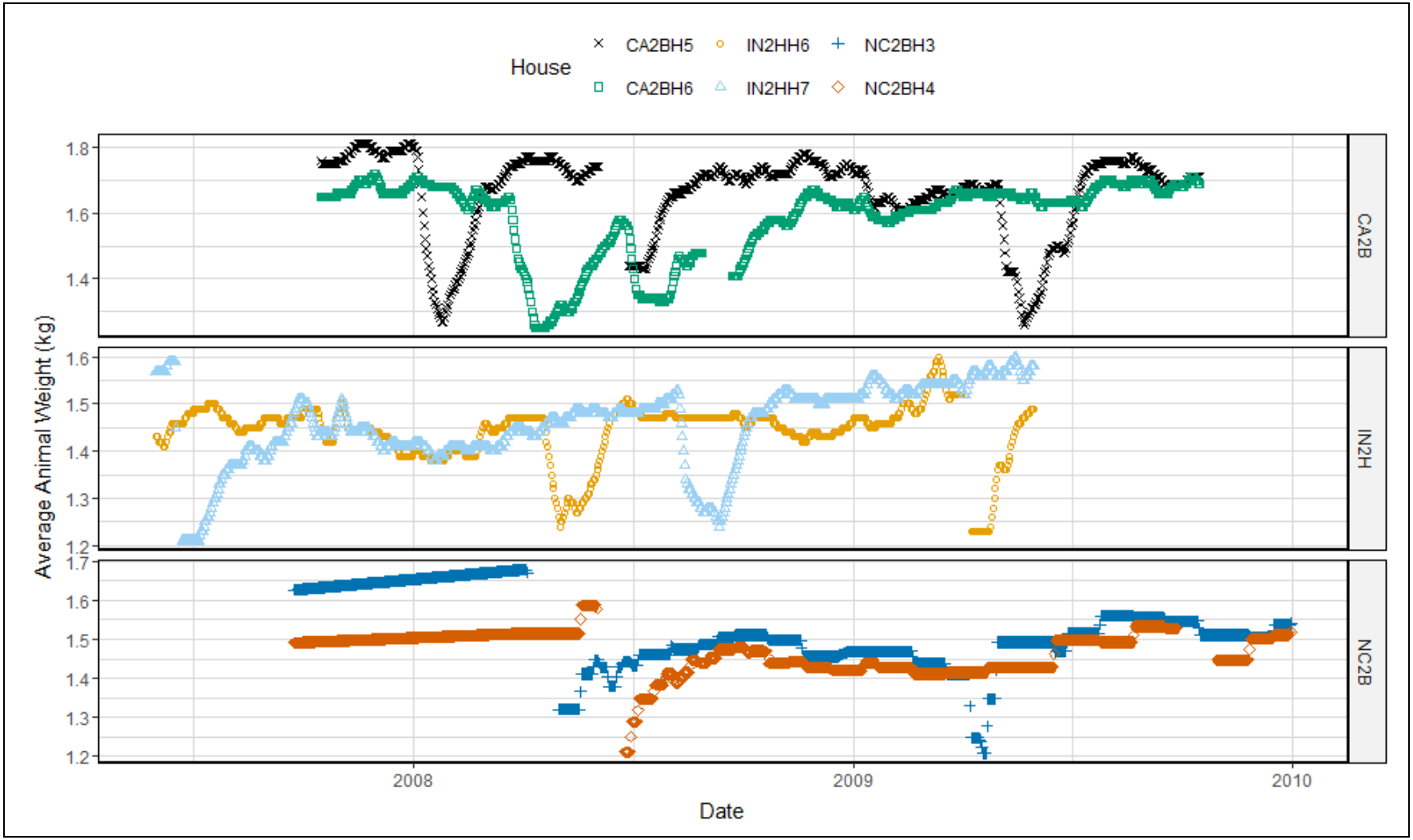

Figure E-12. Average animal weight emission time series for layer high rise house (kg).

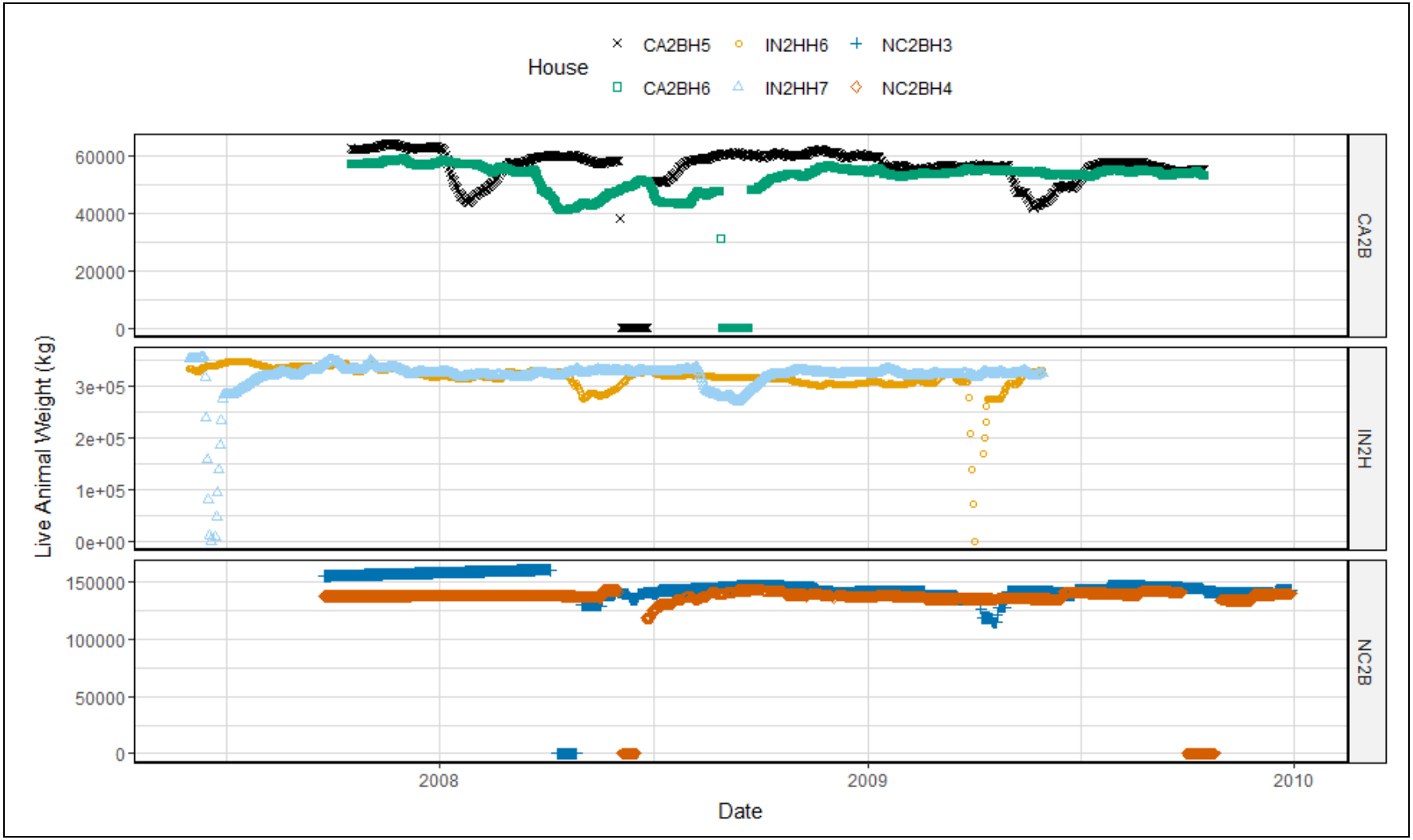

Figure E-13. Live animal weight time series for layer high rise house (kg).

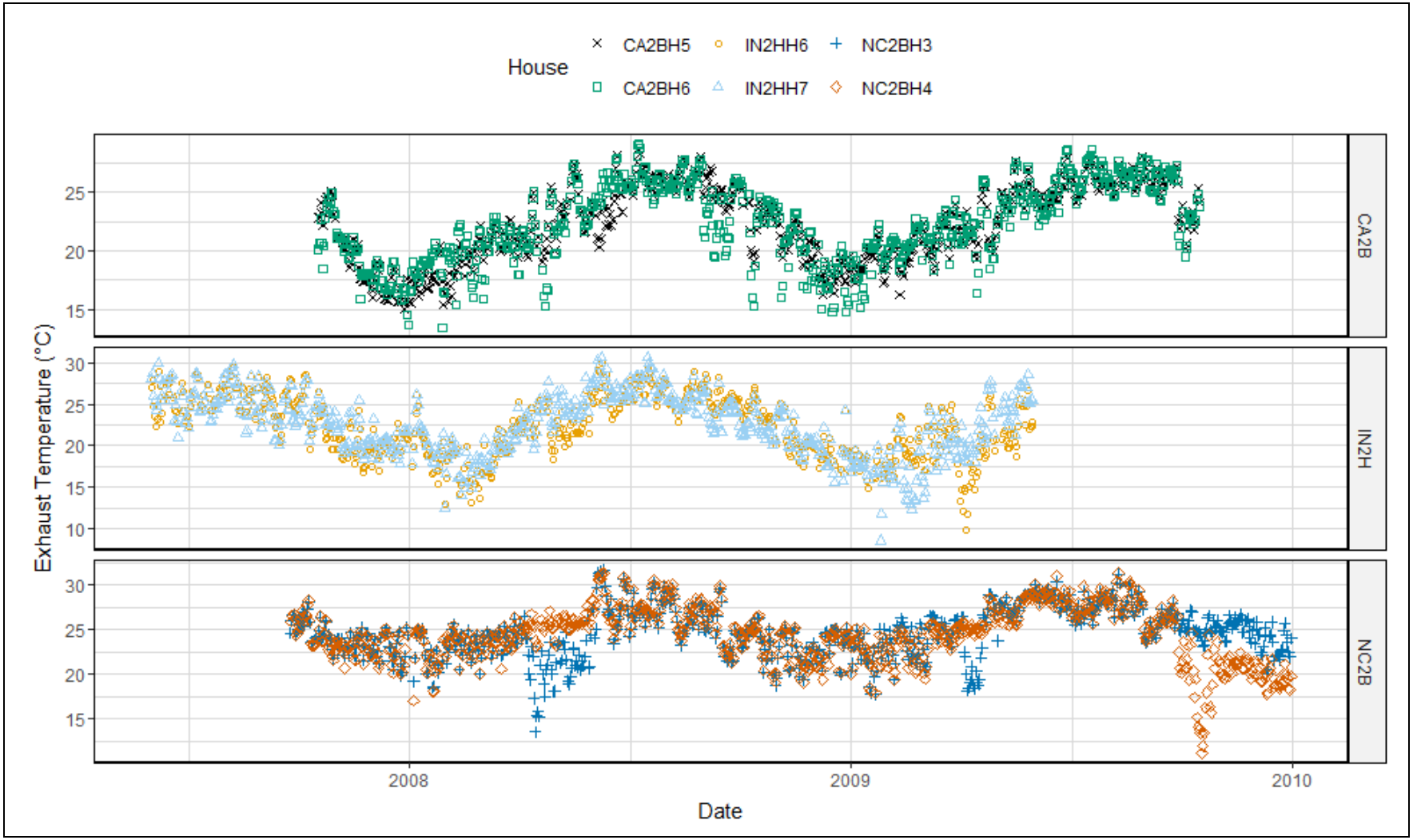

Figure E-14. Exhaust temperature time series for layer high rise house (°C).

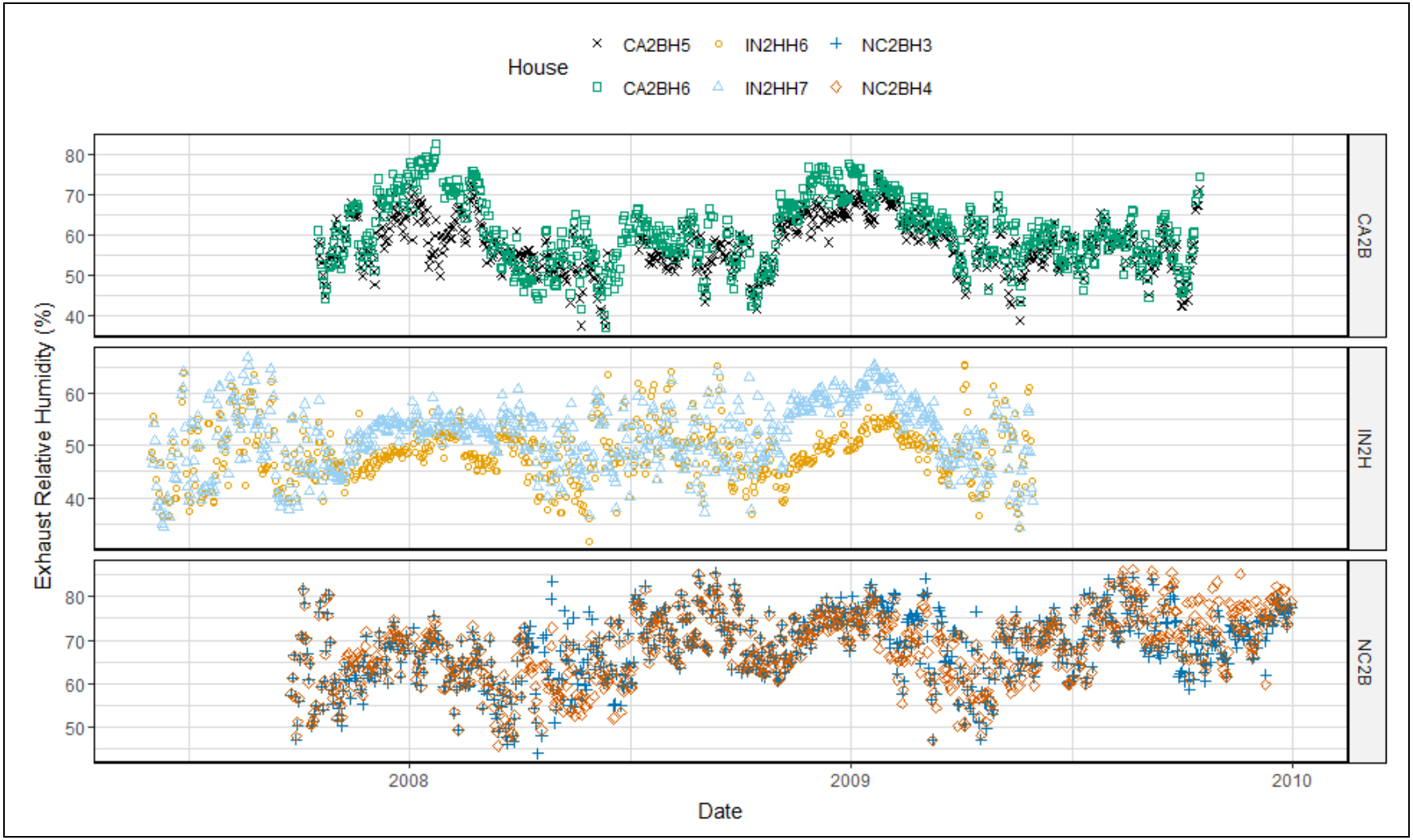

Figure E-15. Exhaust relative humidity time series for layer high rise house (%).

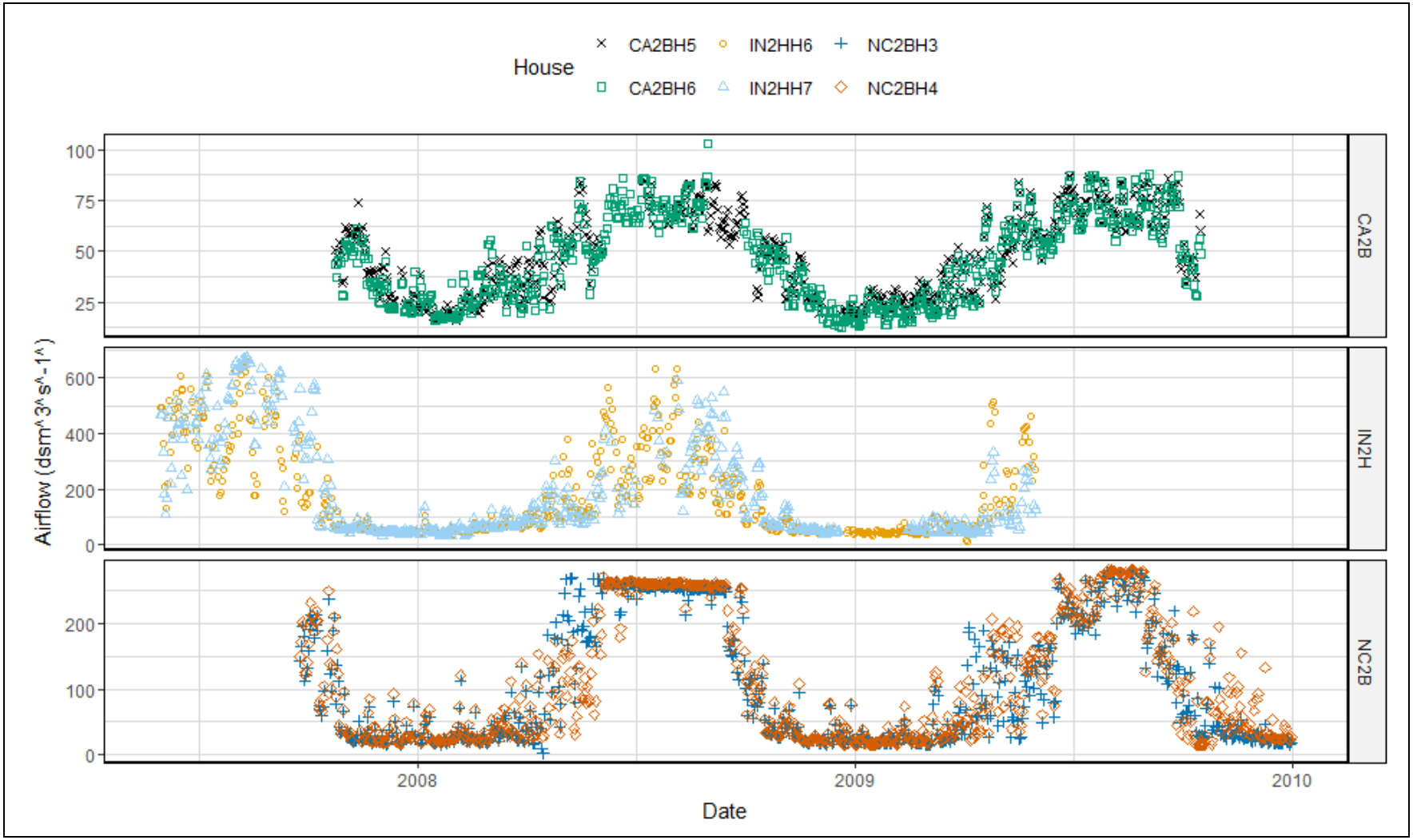

Figure E-16. Airflow time series for layer high rise house ($dscm^3s^{-1}$).

1.3 Ambient

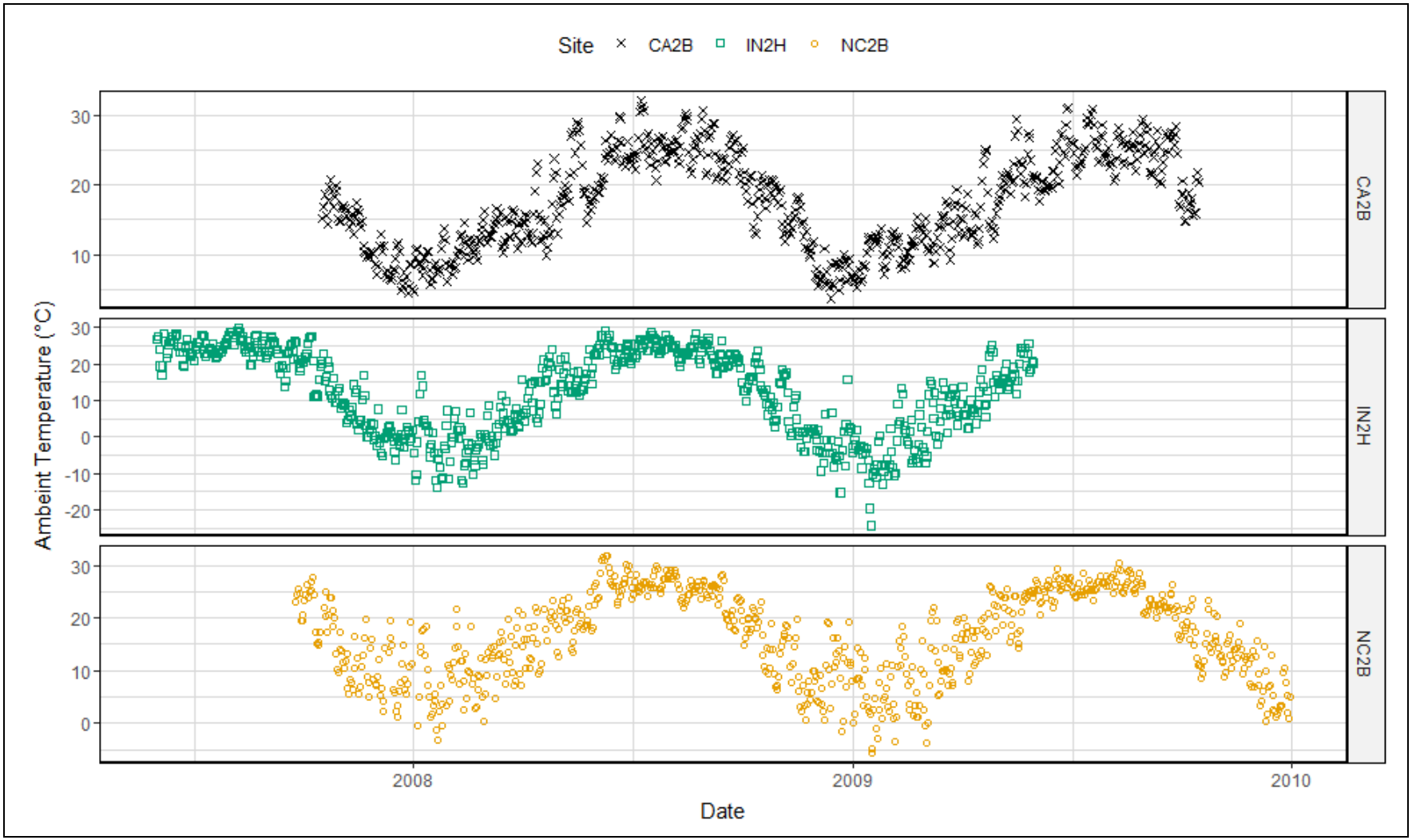

Figure E-17. Ambient temperature time series for layer high rise house (°C).

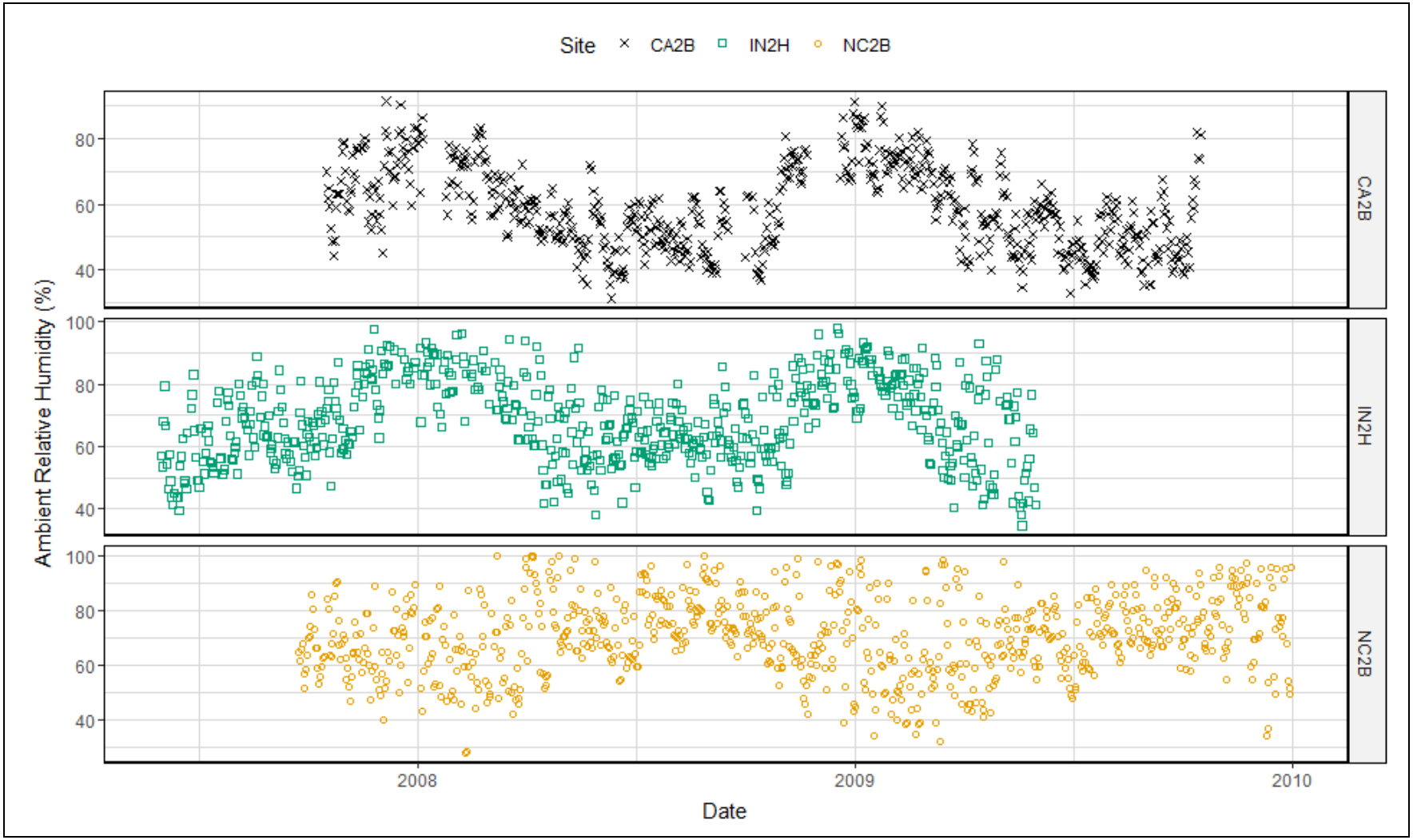

Figure E-18. Ambient relative humidity time series for layer high rise house (%).

2 Belted Houses

2.1 Emissions

2.1.1 Ammonia (NH_3)

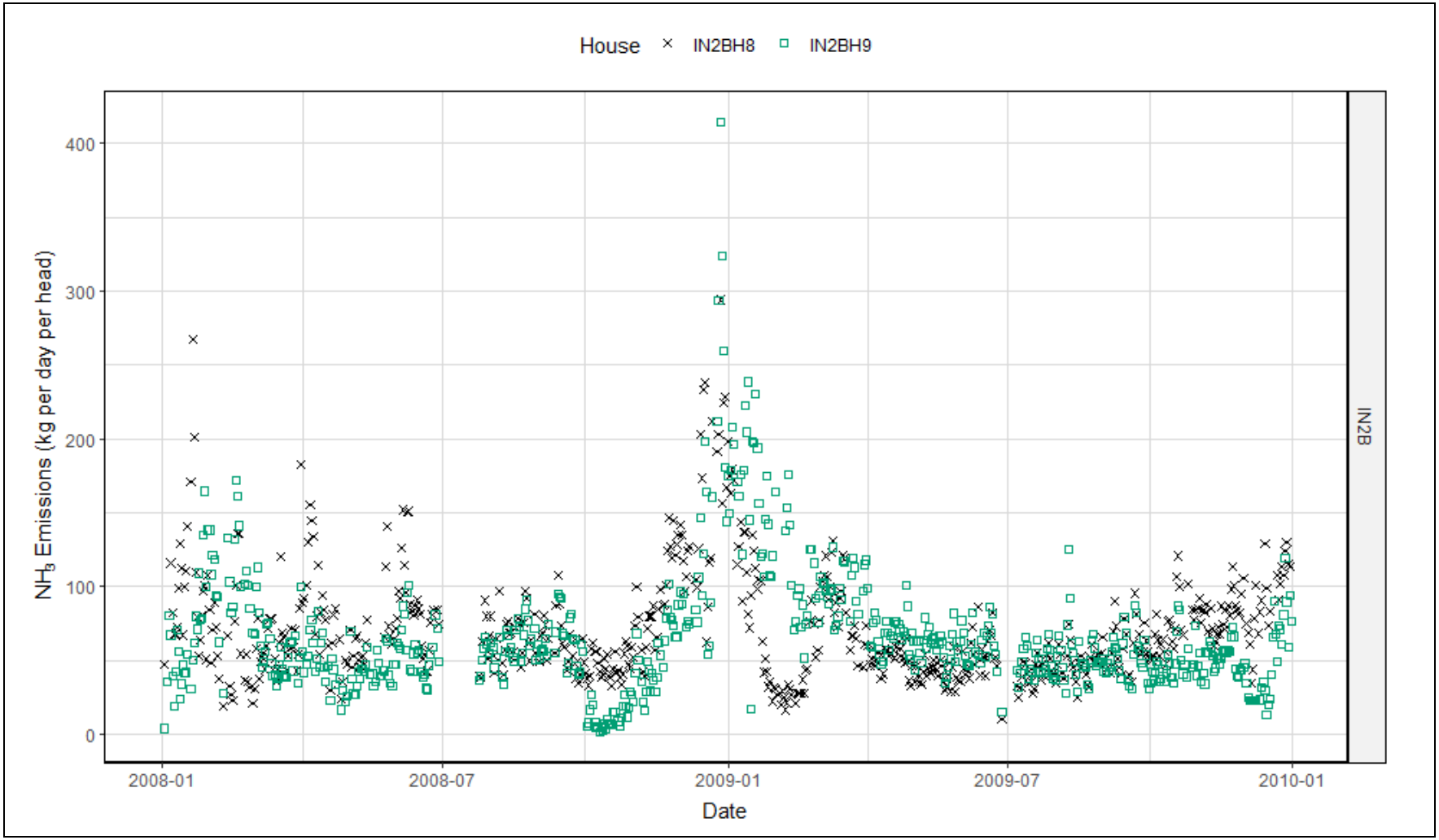

Figure E-19. NH_3 emission time series for layer manure belt houses (kg d^{-1}).

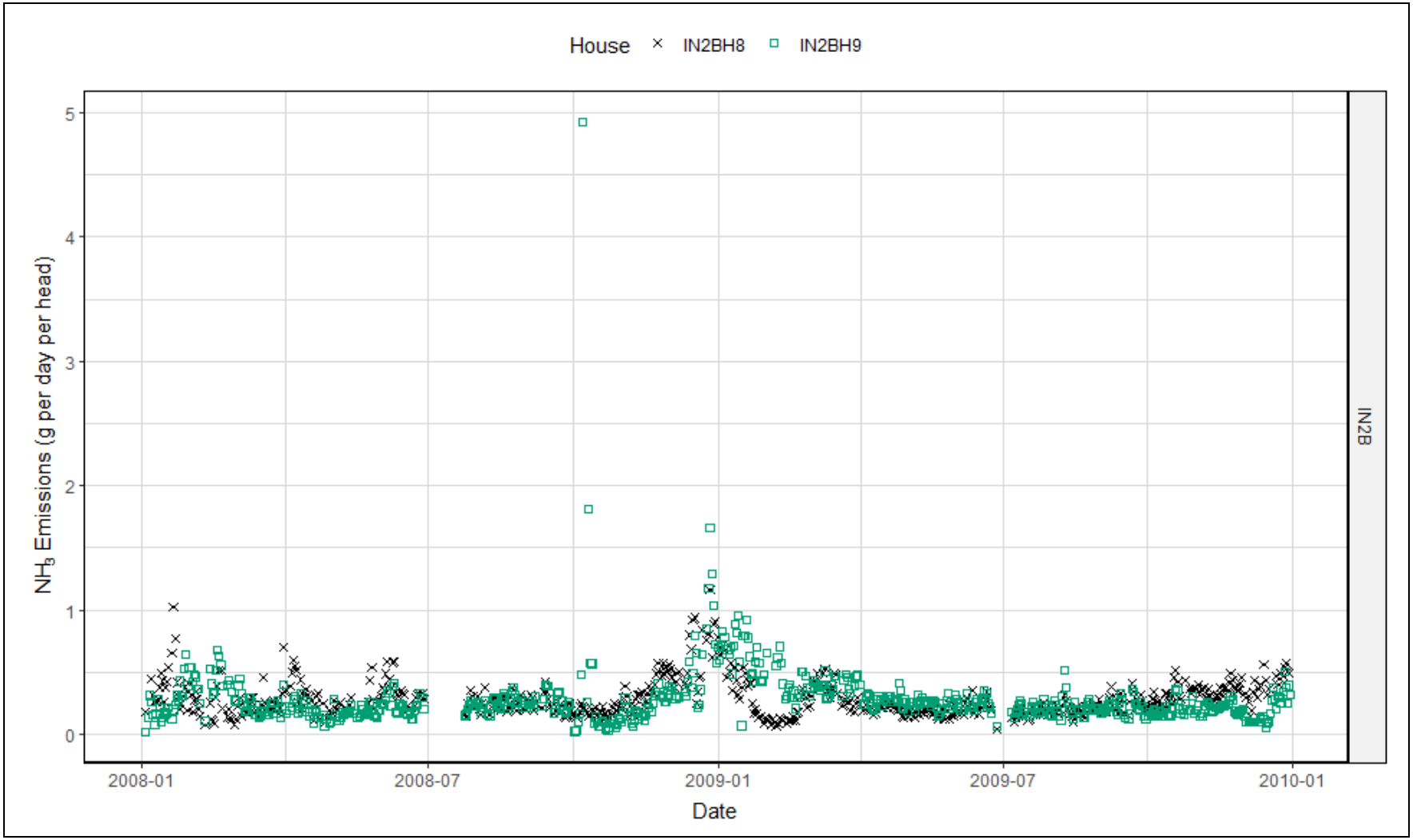

Figure E-20. NH_3 emission time series for layer manure belt houses (g $d^{-1}hd^{-1}$).

2.1.2 Hydrogen Sulfide (H_2S)

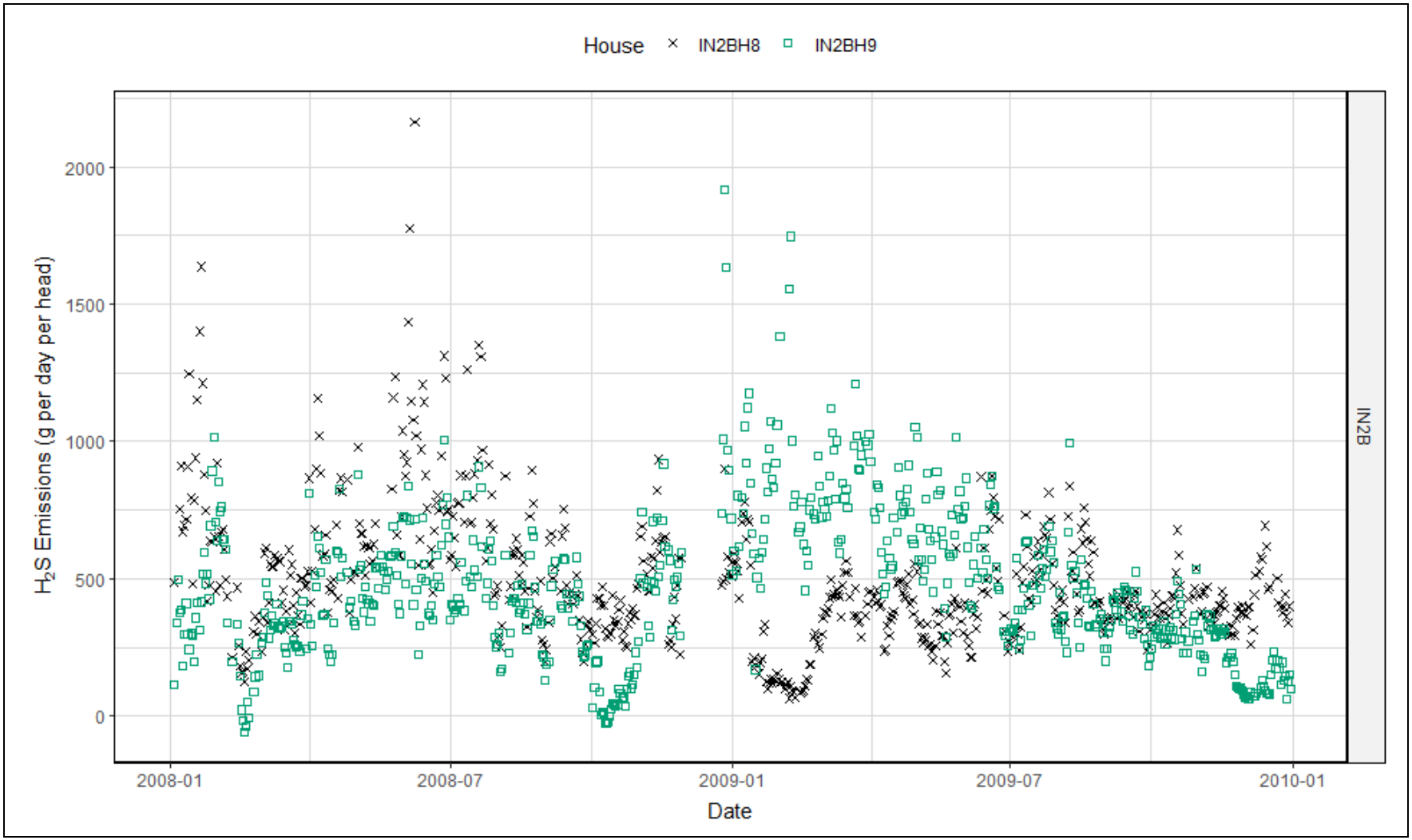

Figure E-21. H_2S emission time series for layer manure belt houses (g d^{-1}).

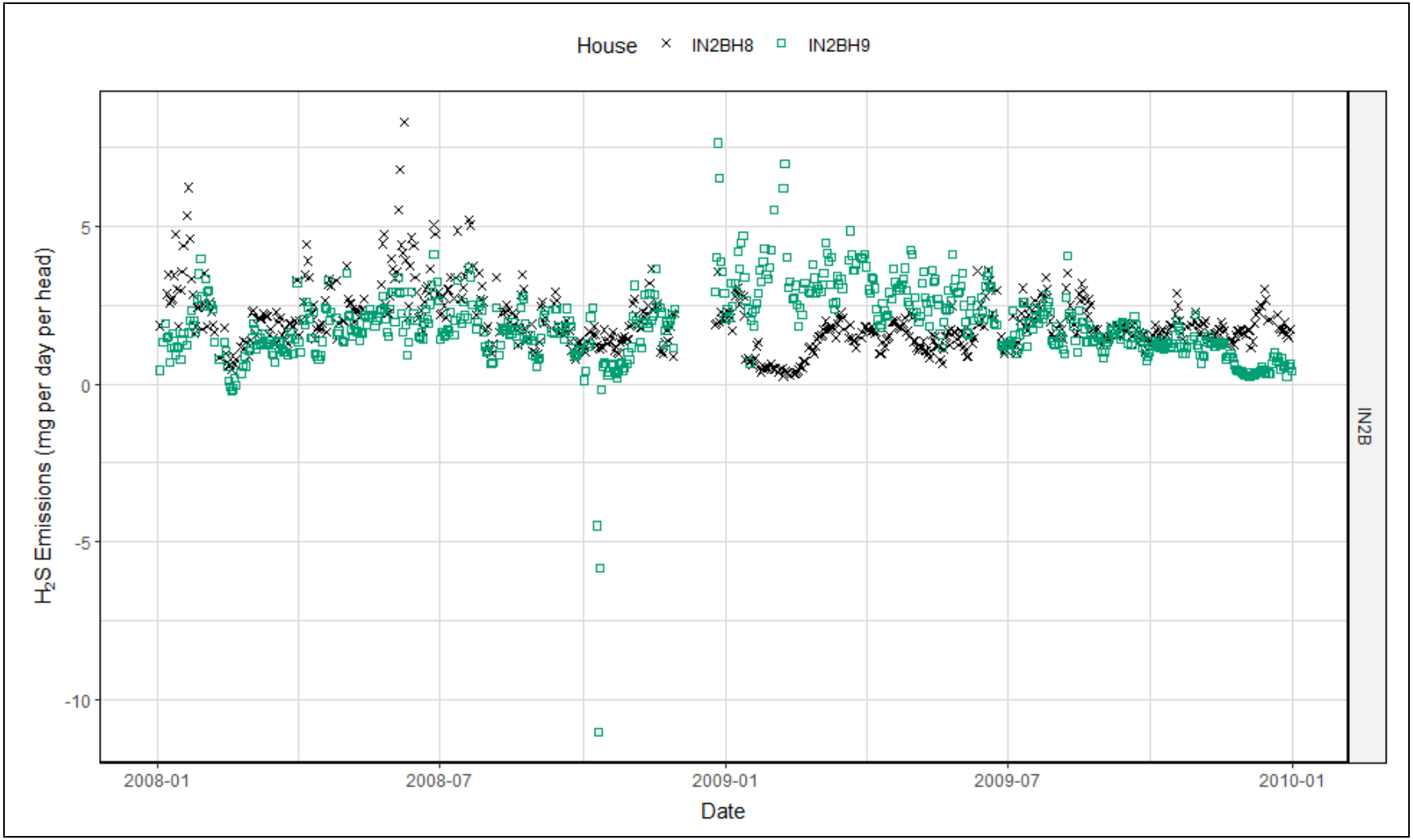

Figure E-22. H_2S emission time series for layer manure belt houses (mg $d^{-1}hd^{-1}$).

2.1.3 Particulate Matter (PM_{10})

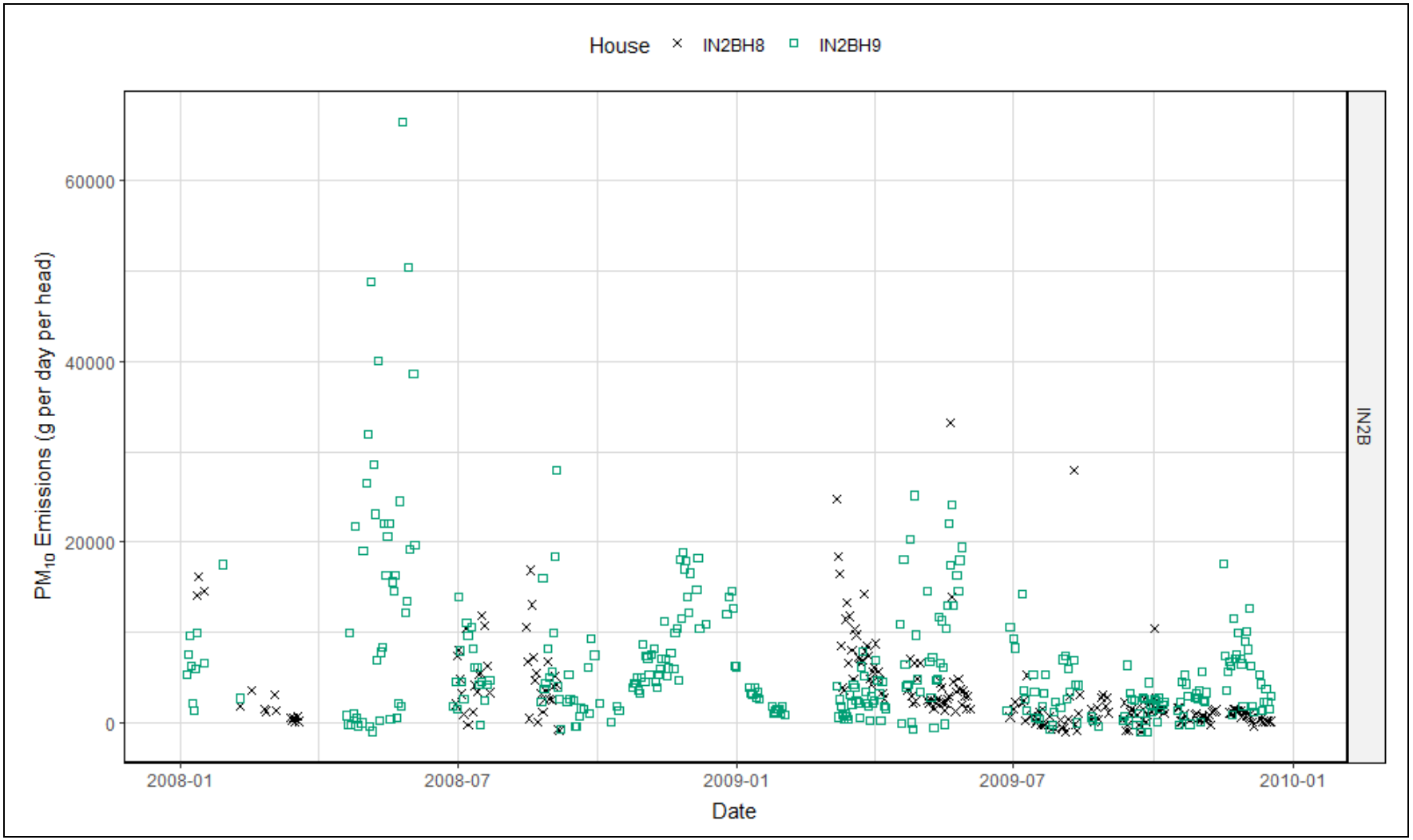

Figure E-23. PM_{10} emission time series for layer manure belt houses (g d^{-1}).

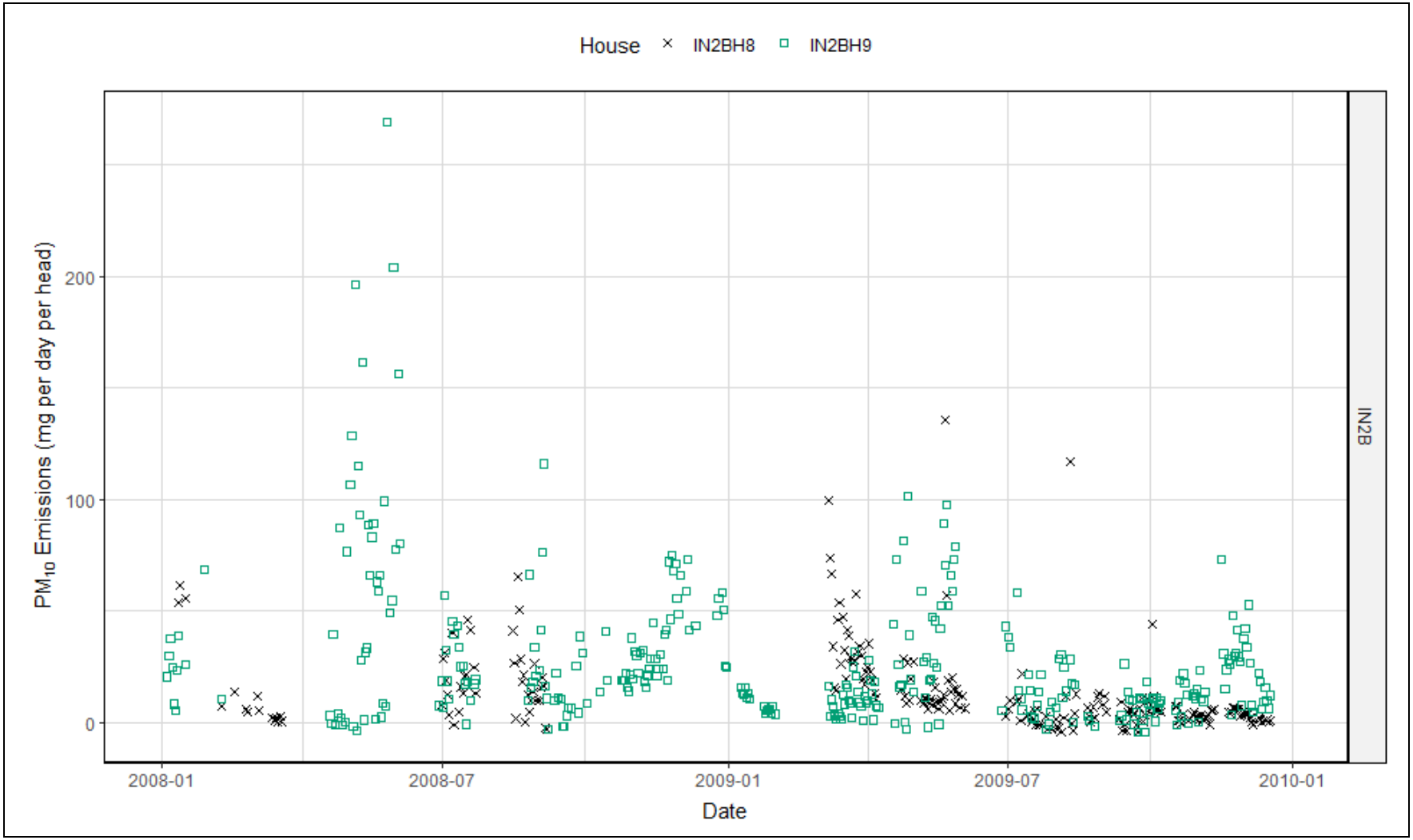

Figure E-24. PM_{10} emission time series for layer manure belt houses (mg $d^{-1}hd^{-1}$).

2.1.4 Particulate Matter ($PM_{2.5}$)

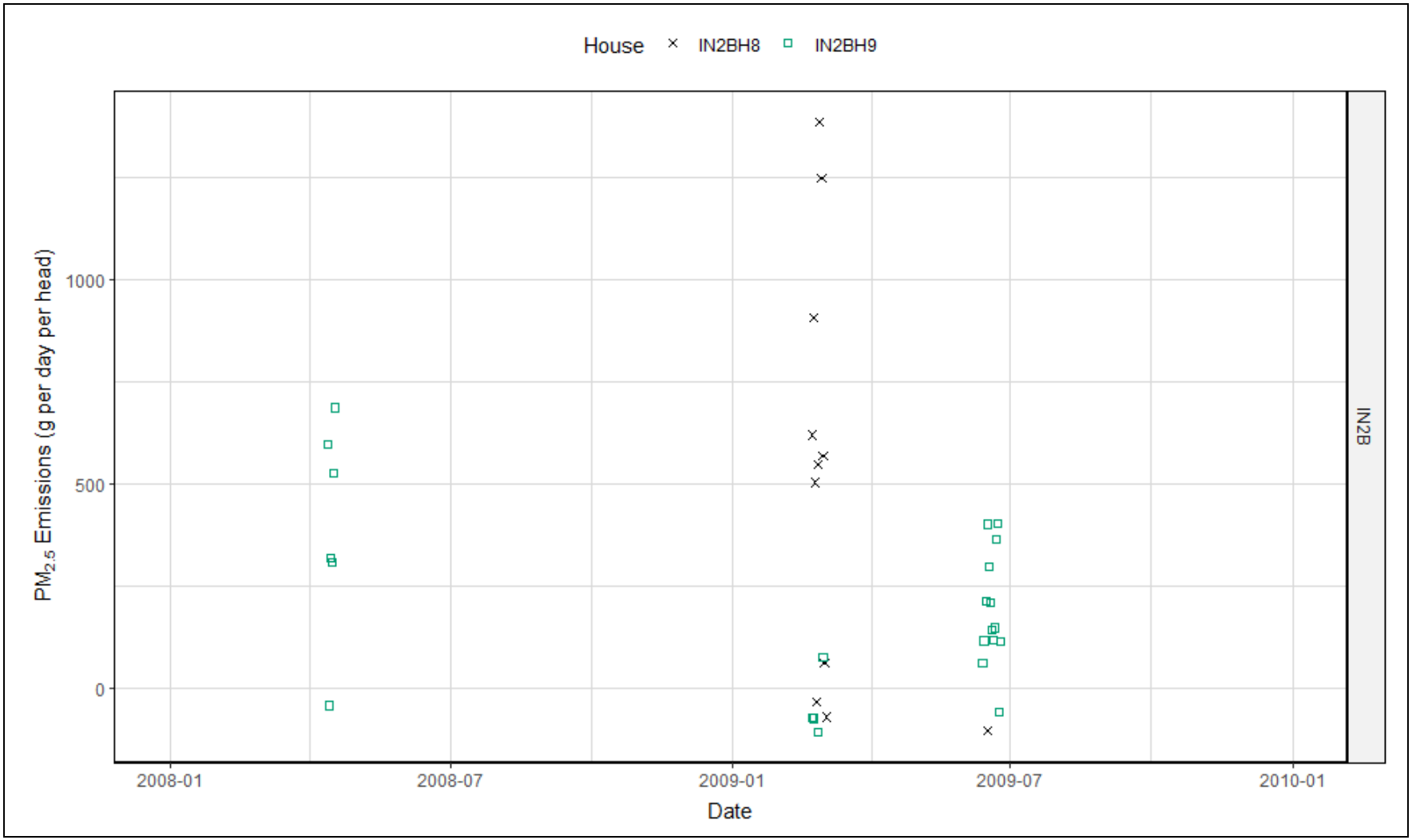

Figure E-25. $PM_{2.5}$ emission time series for layer manure belt houses (g d^{-1}).

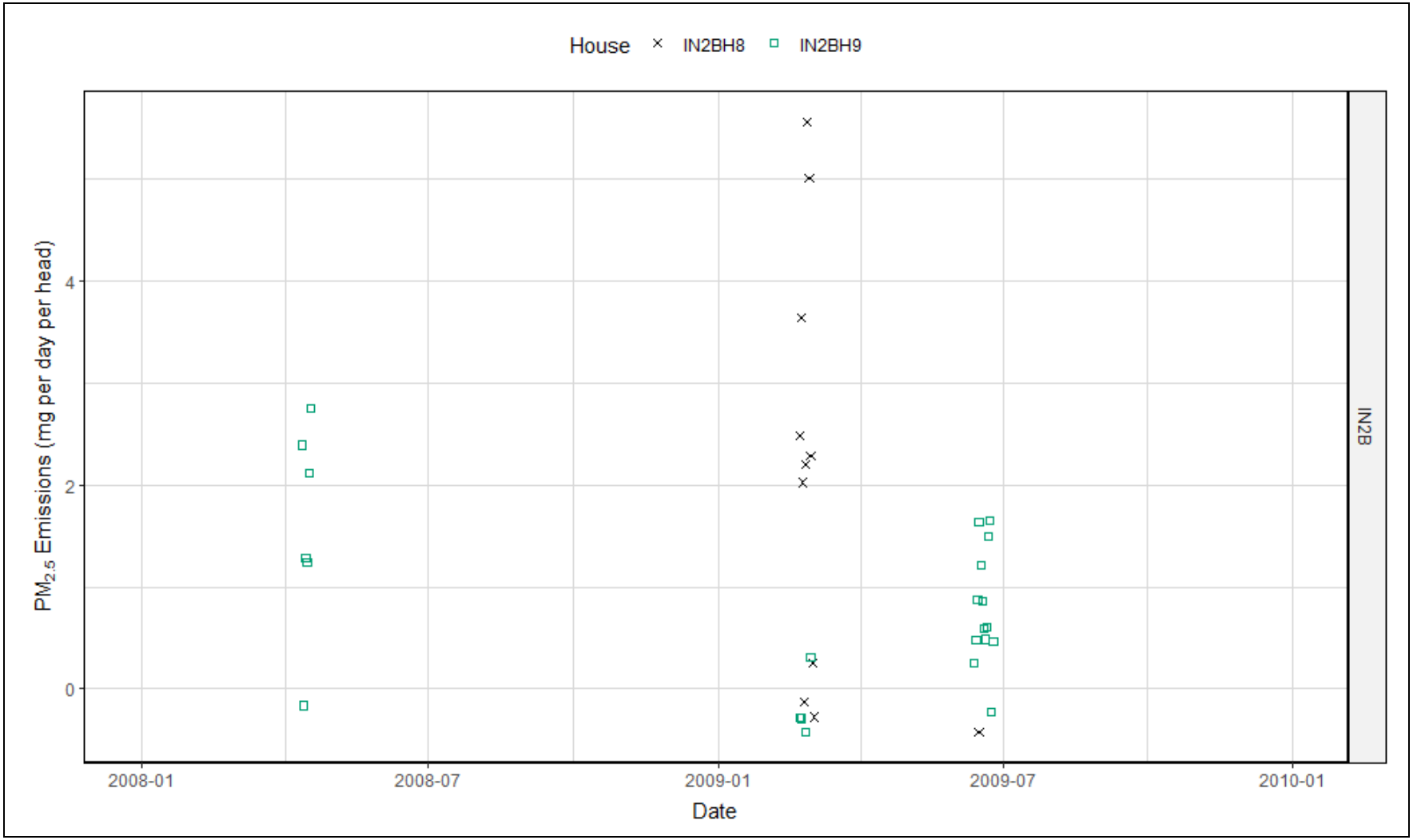

Figure E-26. $PM_{2.5}$ emission time series for layer manure belt houses (mg $d^{-1}hd^{-1}$).

2.1.5 Total Suspended Paticulates (TSP)

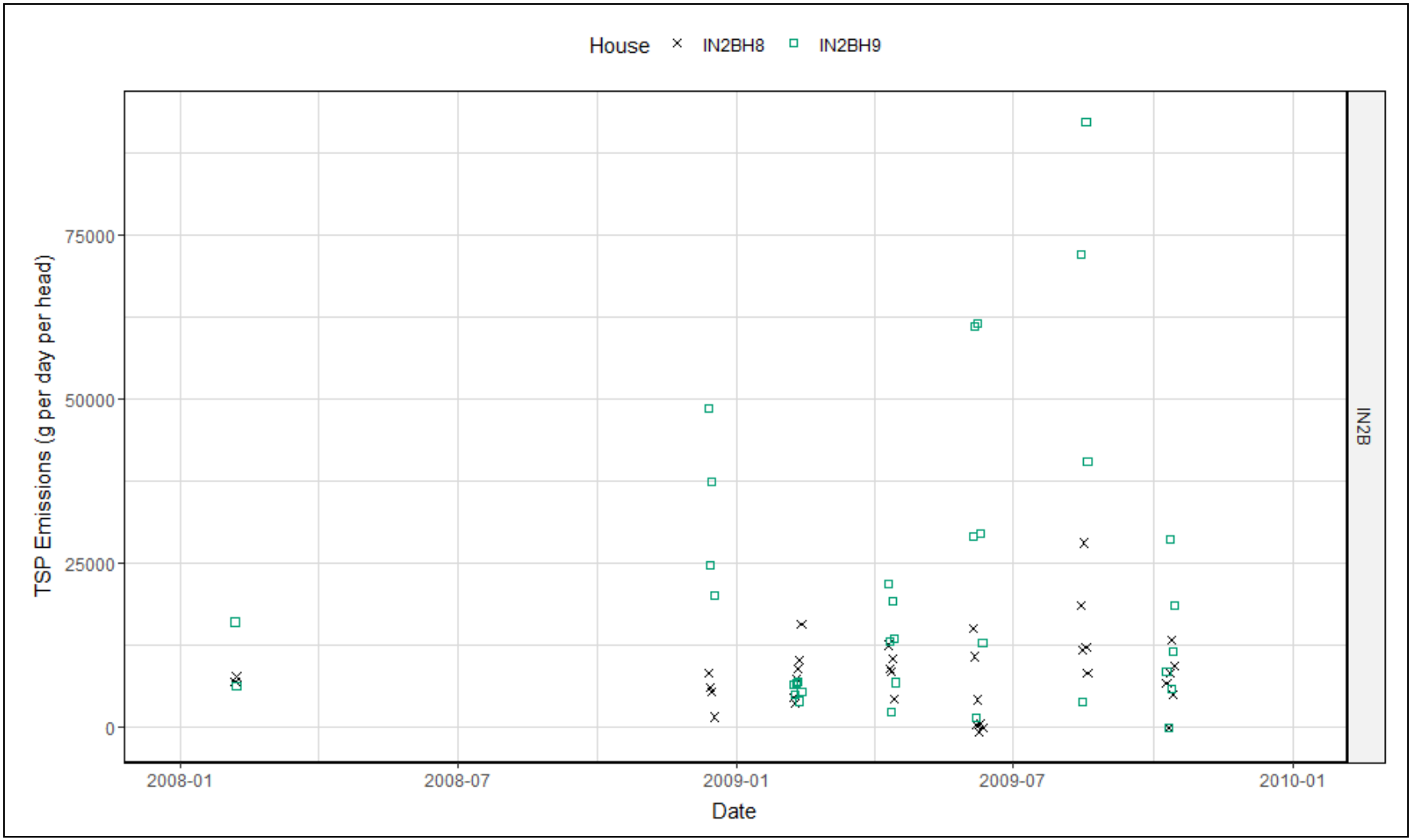

Figure E-27. TSP emission time series for layer manure belt houses (g d^{-1}).

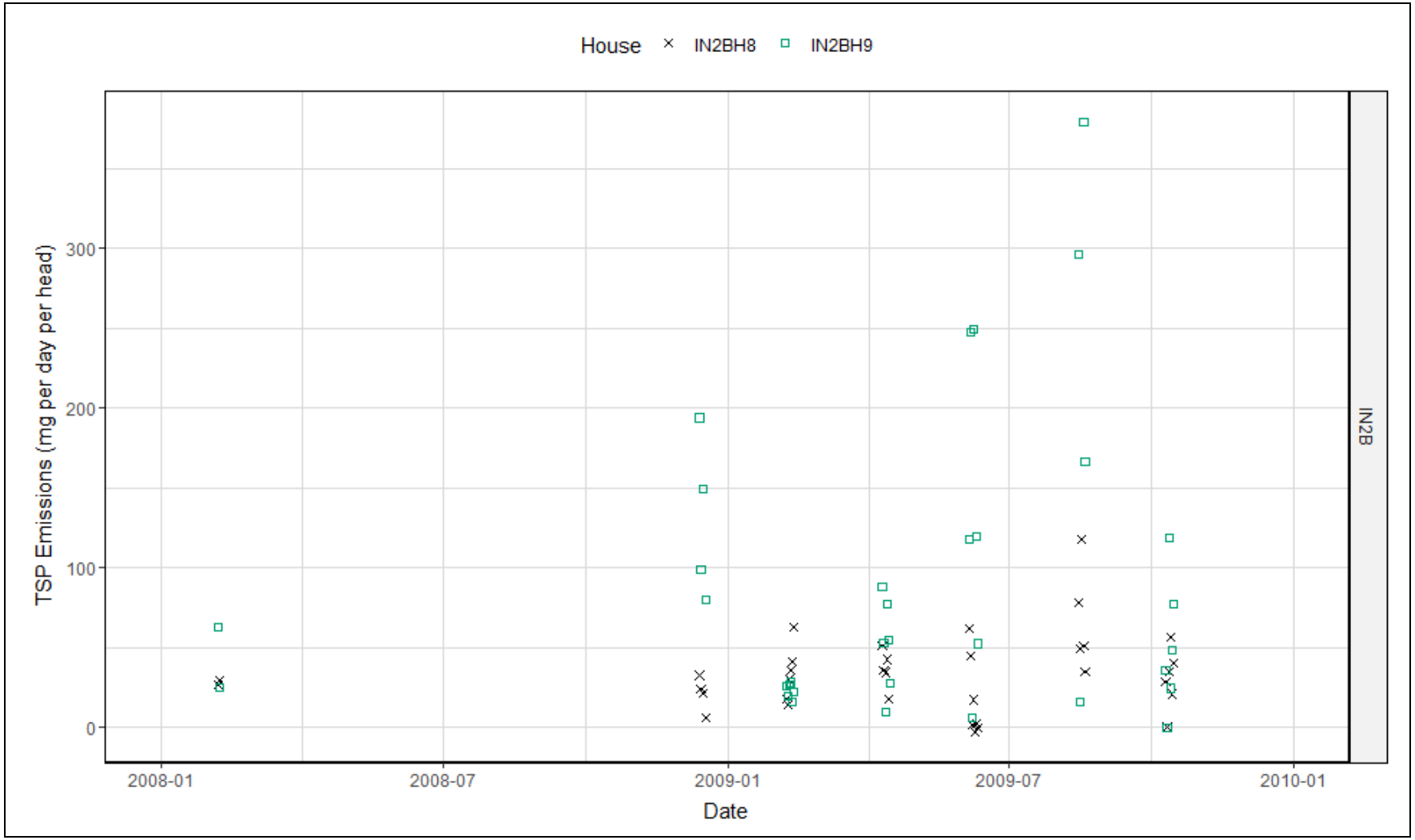

Figure E-28. TSP emission time series for layer manure belt houses (mg $d^{-1}hd^{-1}$).

2.2 Environmental

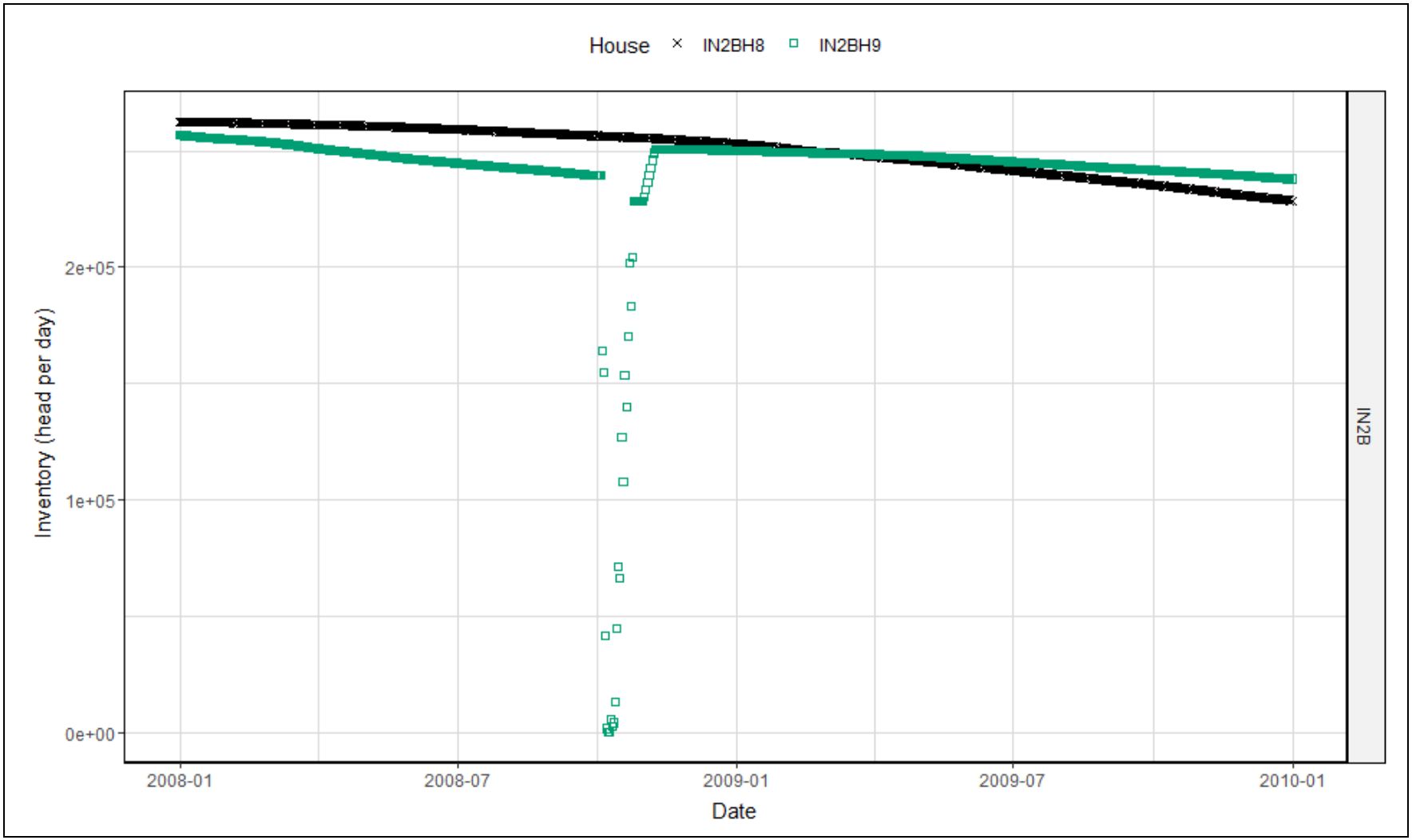

Figure E-29. Inventory time series for layer manure belt houses (hd).

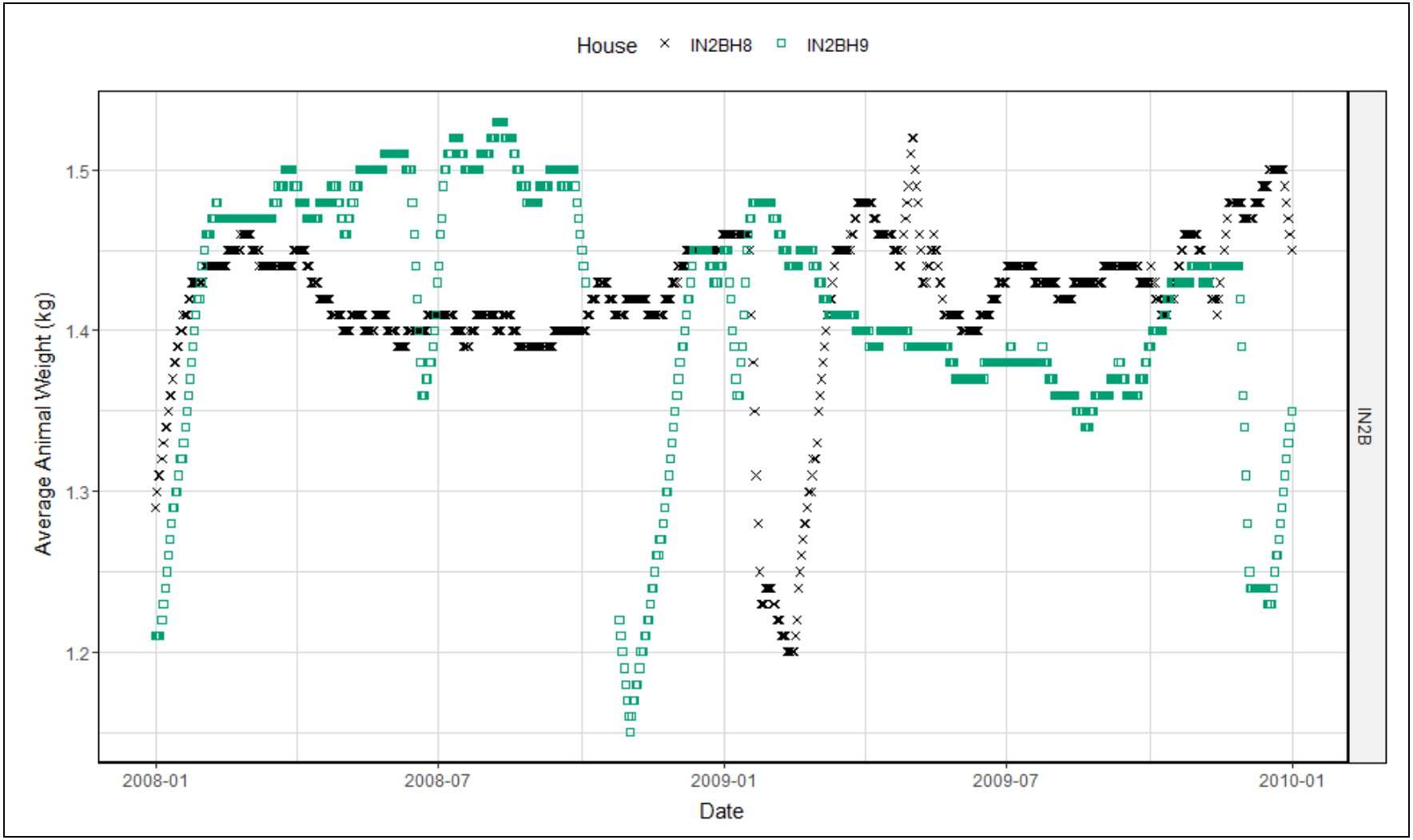

Figure E-30. Average animal weight emission time series for layer manure belt houses (kg).

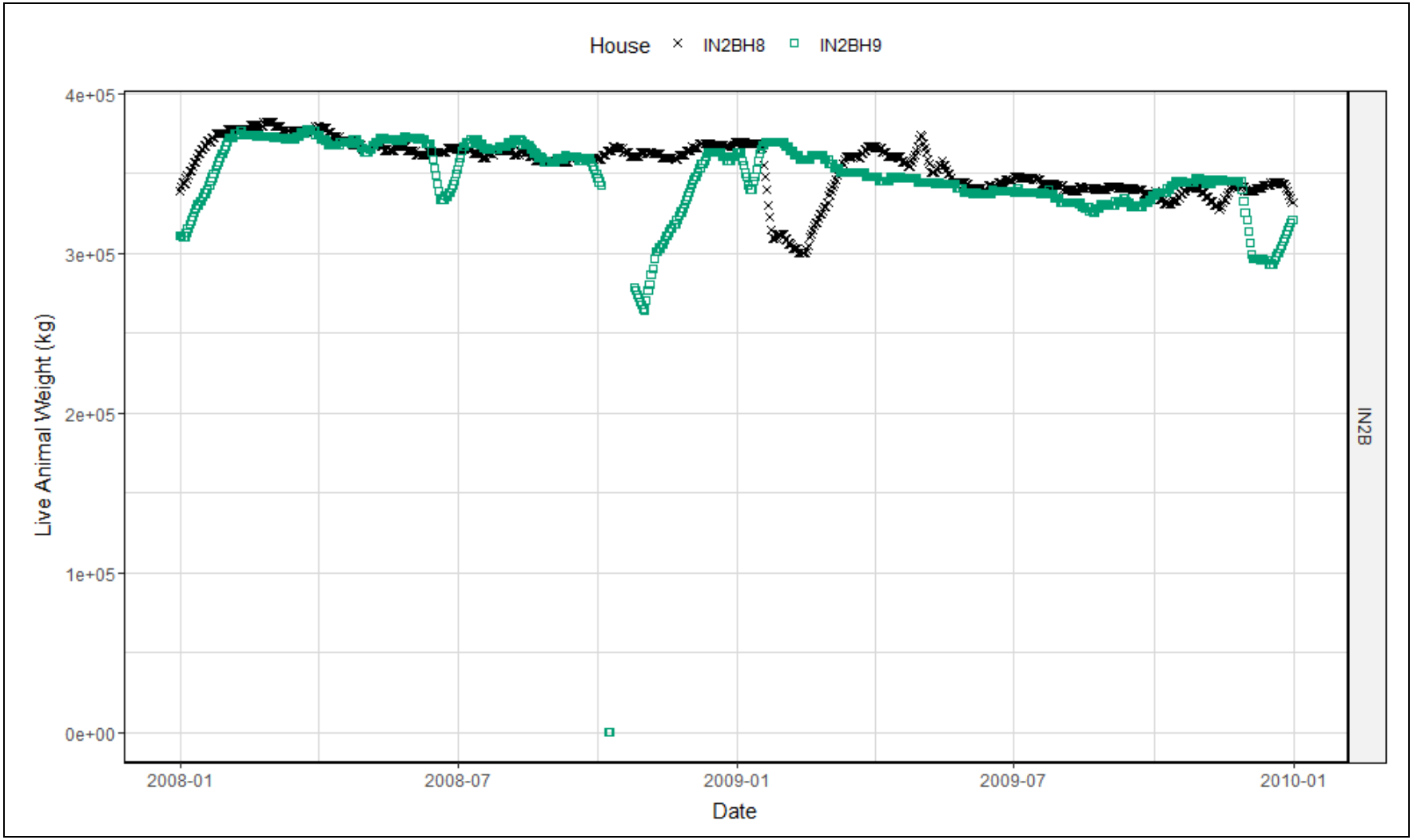

Figure E-31. Live animal weight time series for layer manure belt houses (kg).

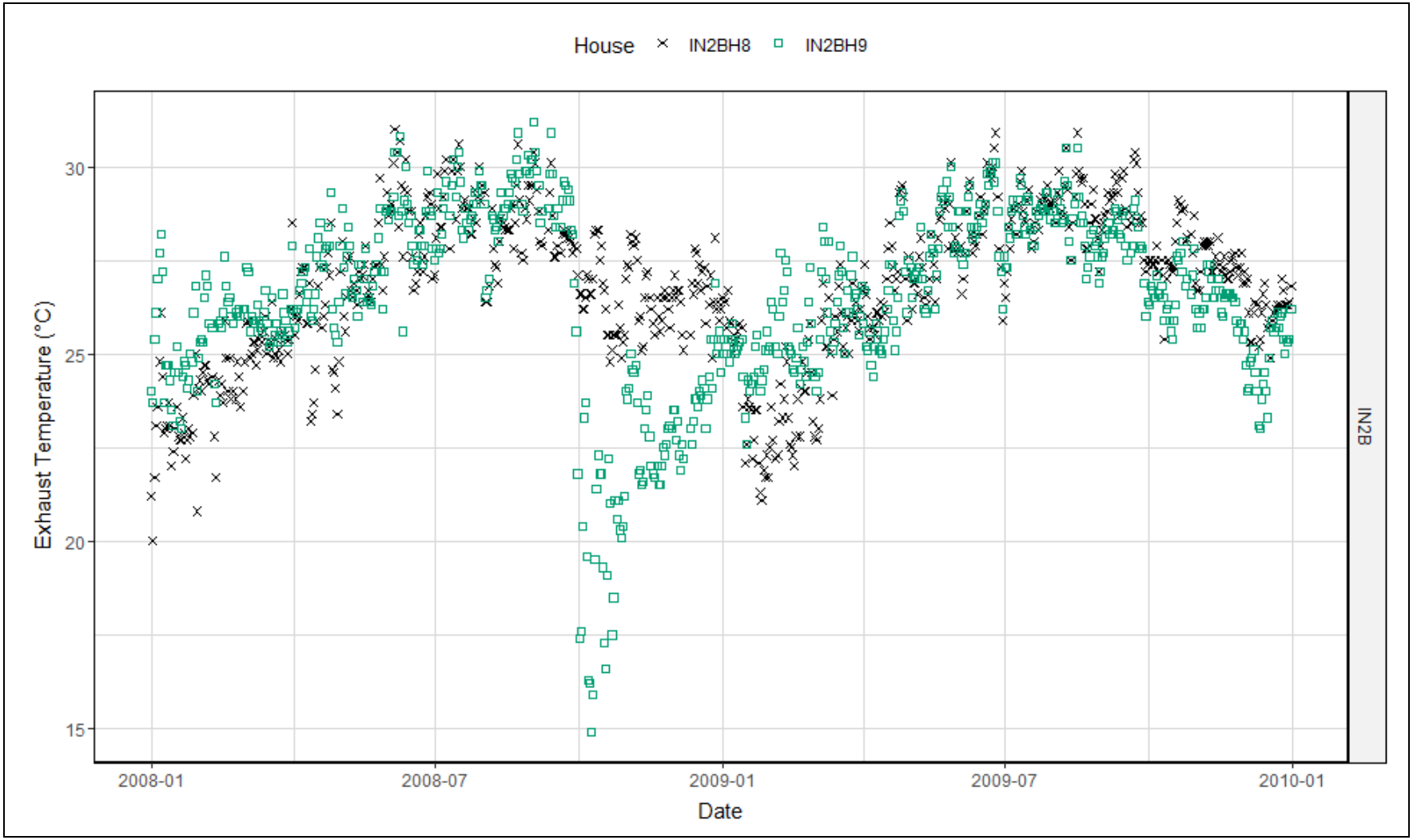

Figure E-32. Exhaust temperature time series for layer manure belt houses (°C).

Figure E-33. Exhaust relative humidity time series for layer manure belt houses (%).

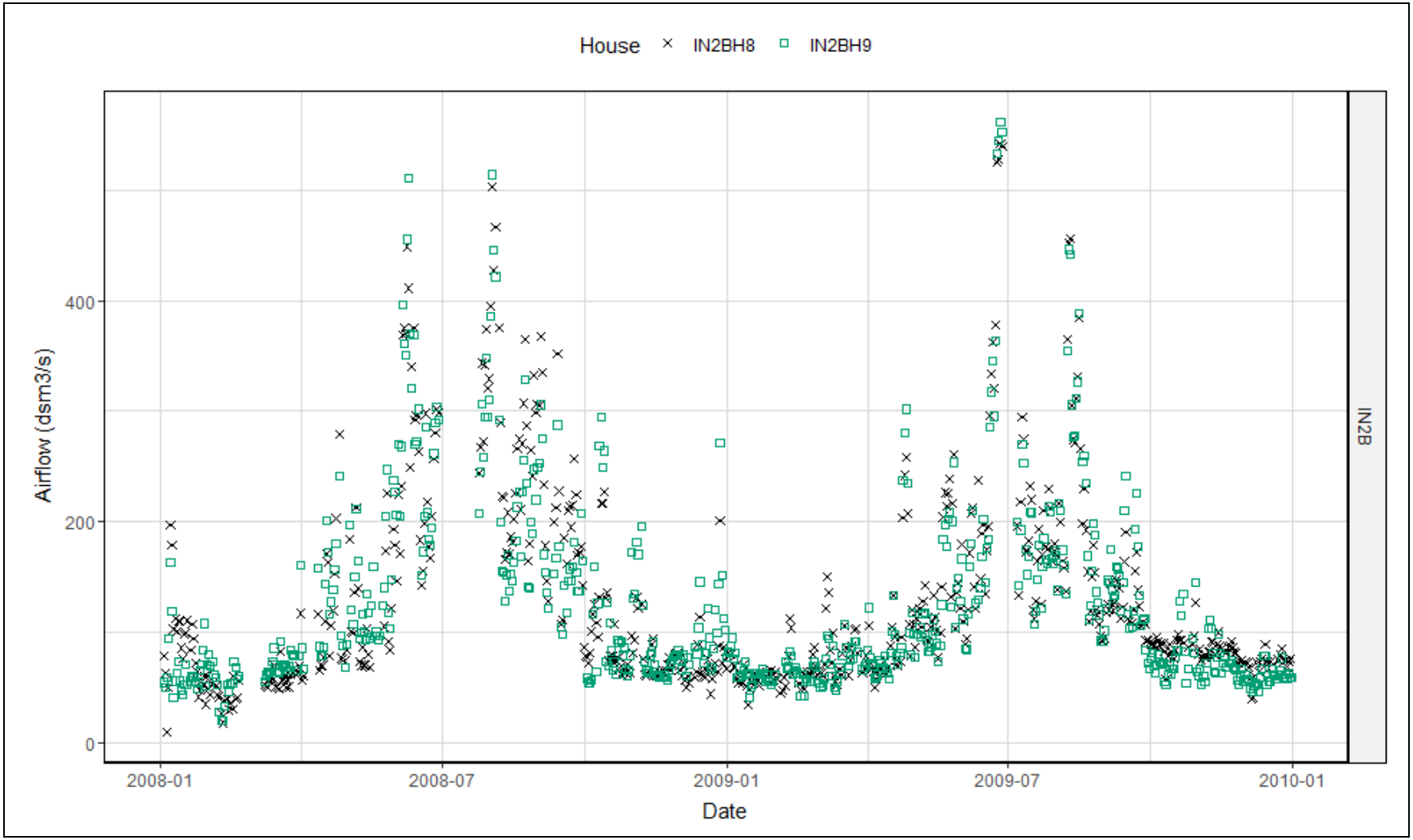

Figure E-34. Airflow time series for layer manure belt houses ($dscm^3s^{-1}$).

2.3 Ambient

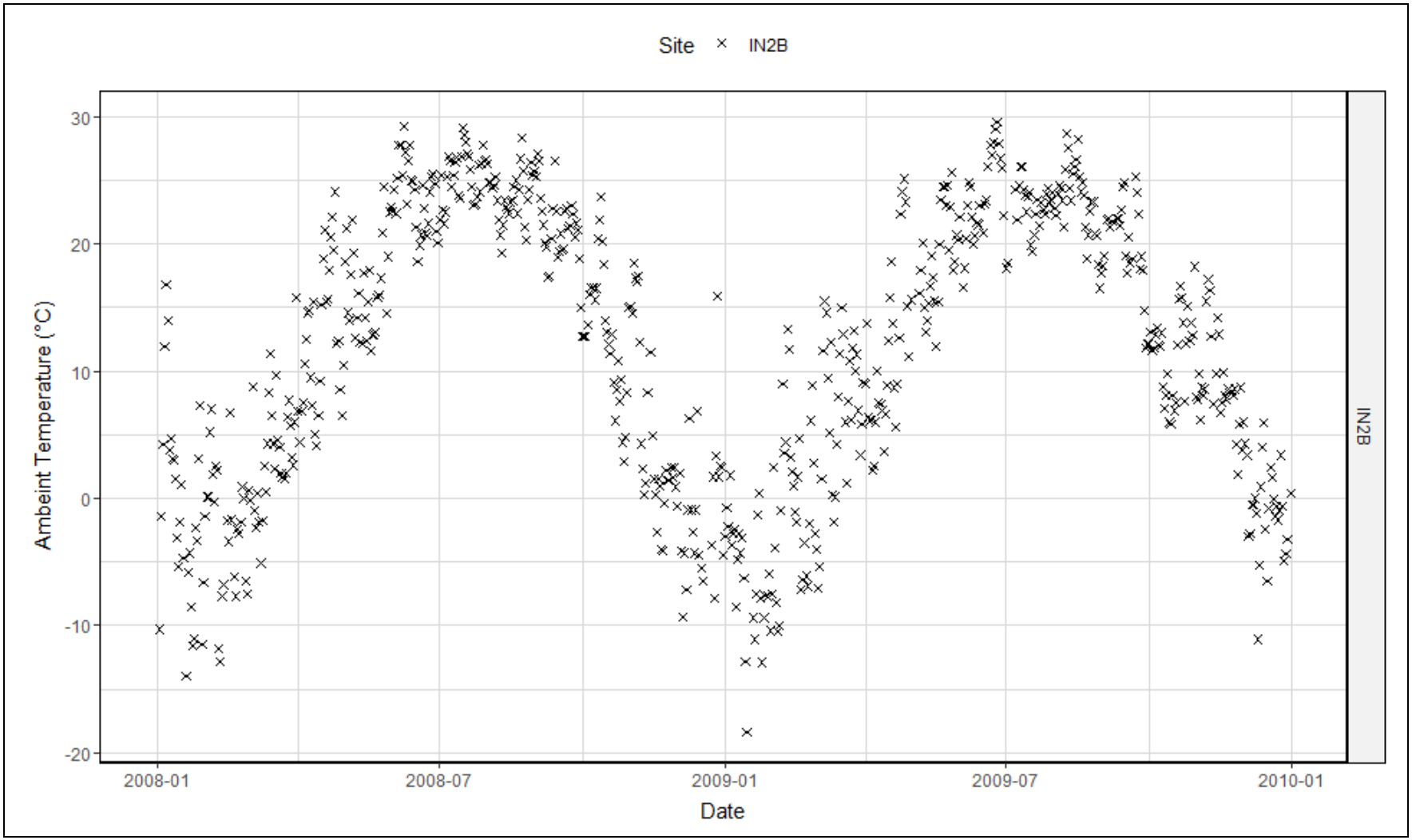

Figure E-35. Ambient temperature time series for layer manure belt houses (°C).

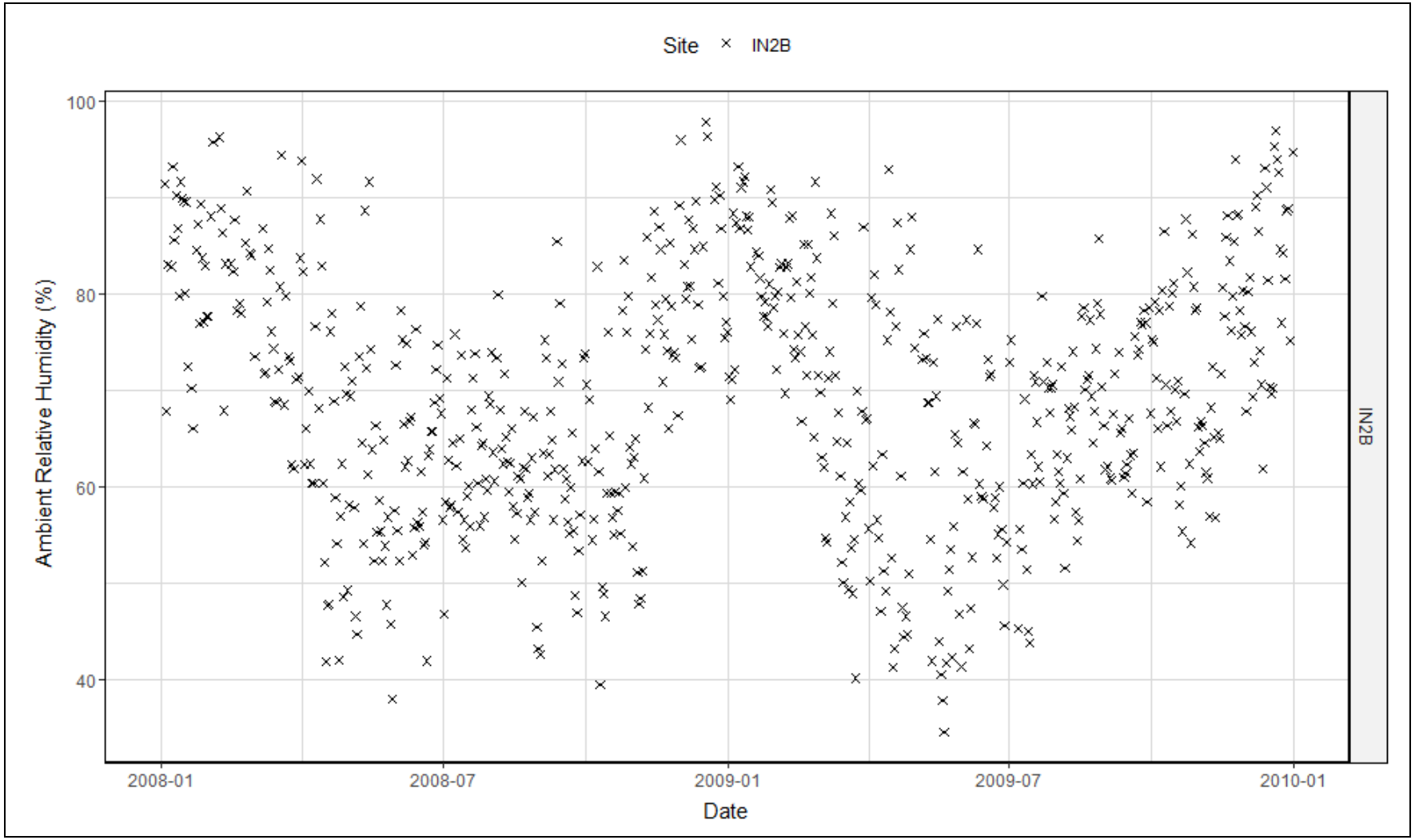

Figure E-36. Ambient relative humidity time series for layer manure belt houses (%).

3 Manure Sheds

3.1 Emissions

3.1.1 Ammonia (NH_3)

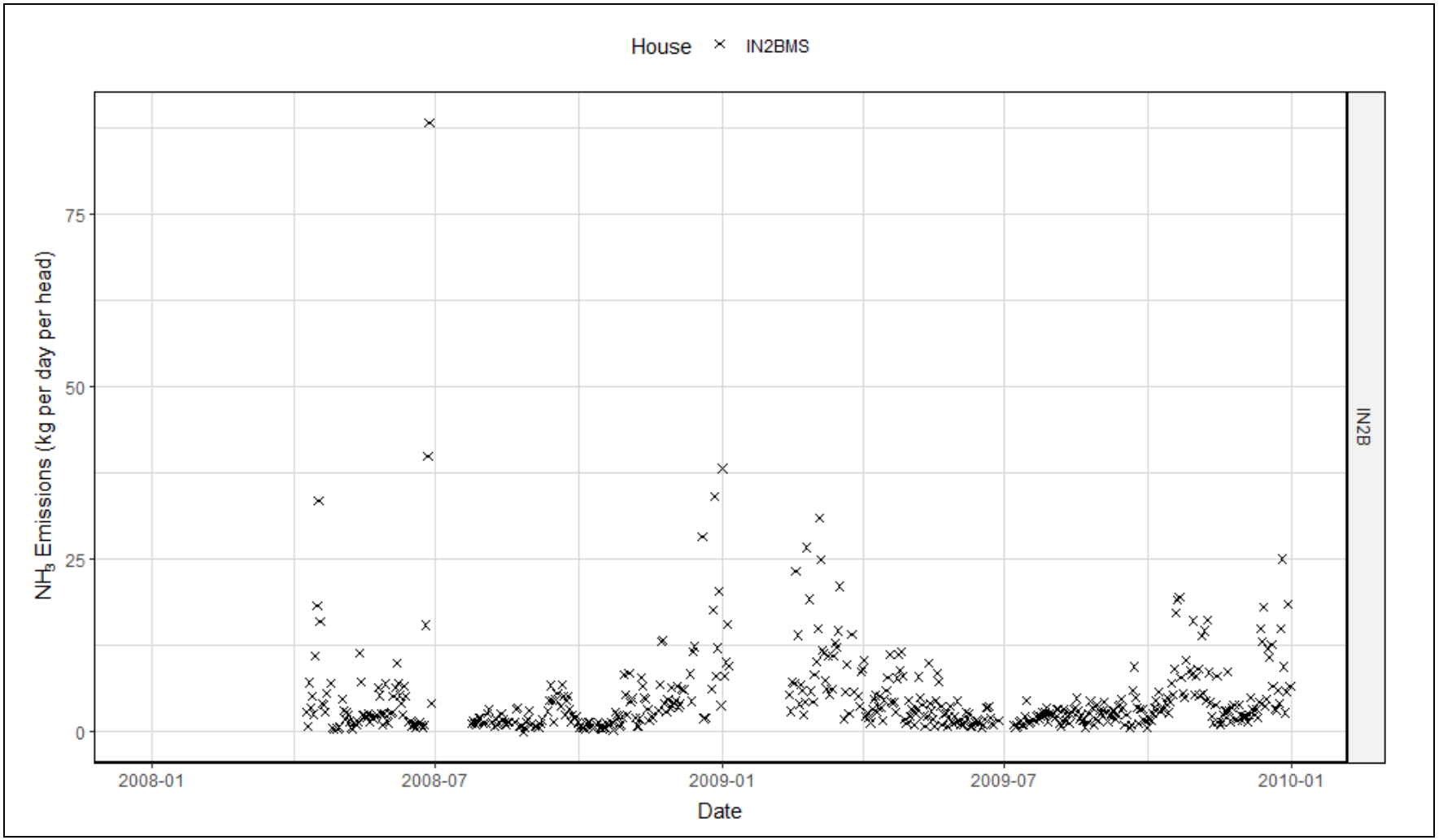

Figure E-37. NH_3 emission time series for layer manure sheds (kg d^{-1}).

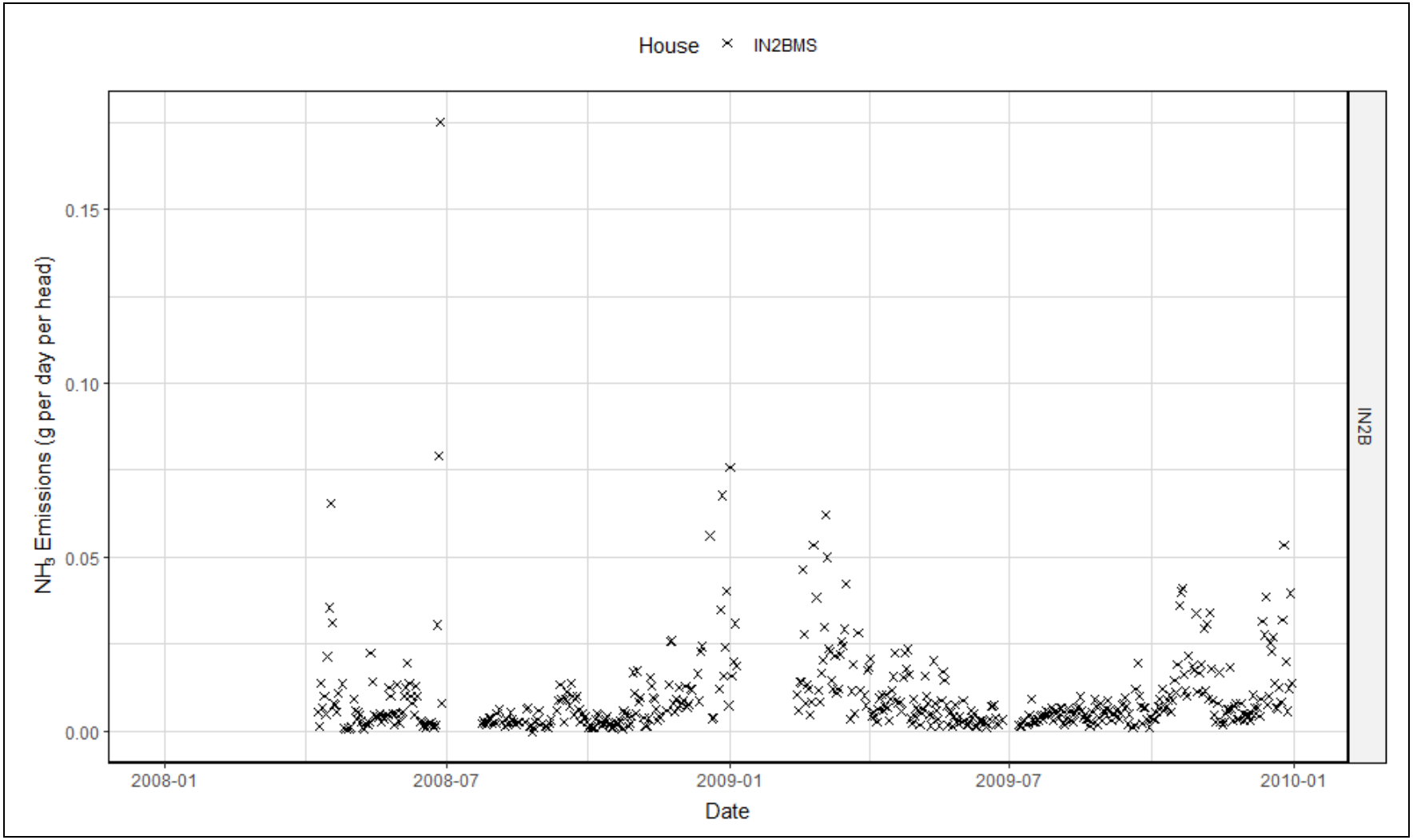

Figure E-38. NH_3 emission time series for layer manure sheds (g $d^{-1}hd^{-1}$).

3.1.2 Hydrogen Sulfide (H_2S)

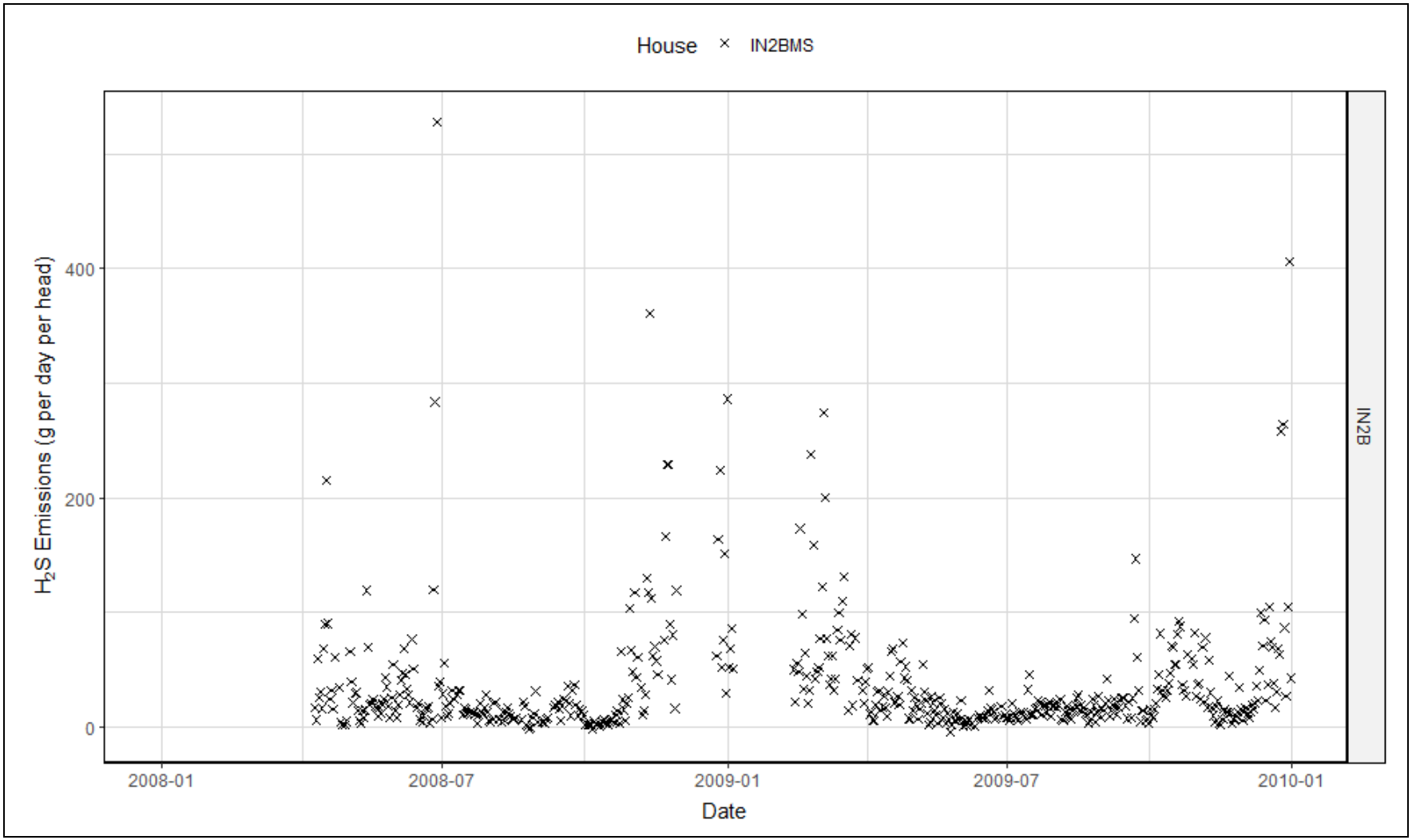

Figure E-39. H_2S emission time series for layer manure sheds (g d^{-1}).

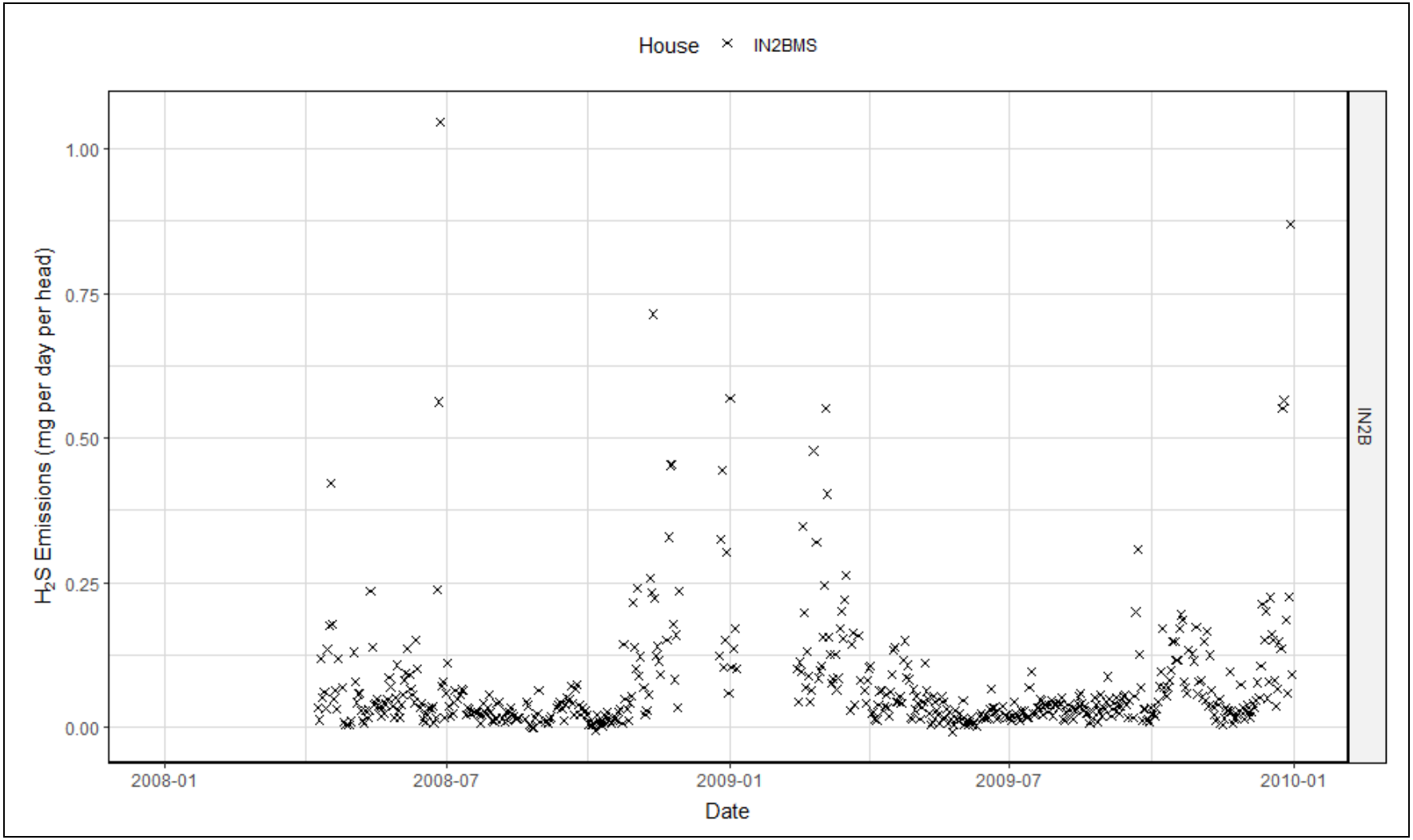

Figure E-40. H_2S emission time series for layer manure sheds (mg $d^{-1}hd^{-1}$).

3.1.3 Particulate Matter (PM_{10})

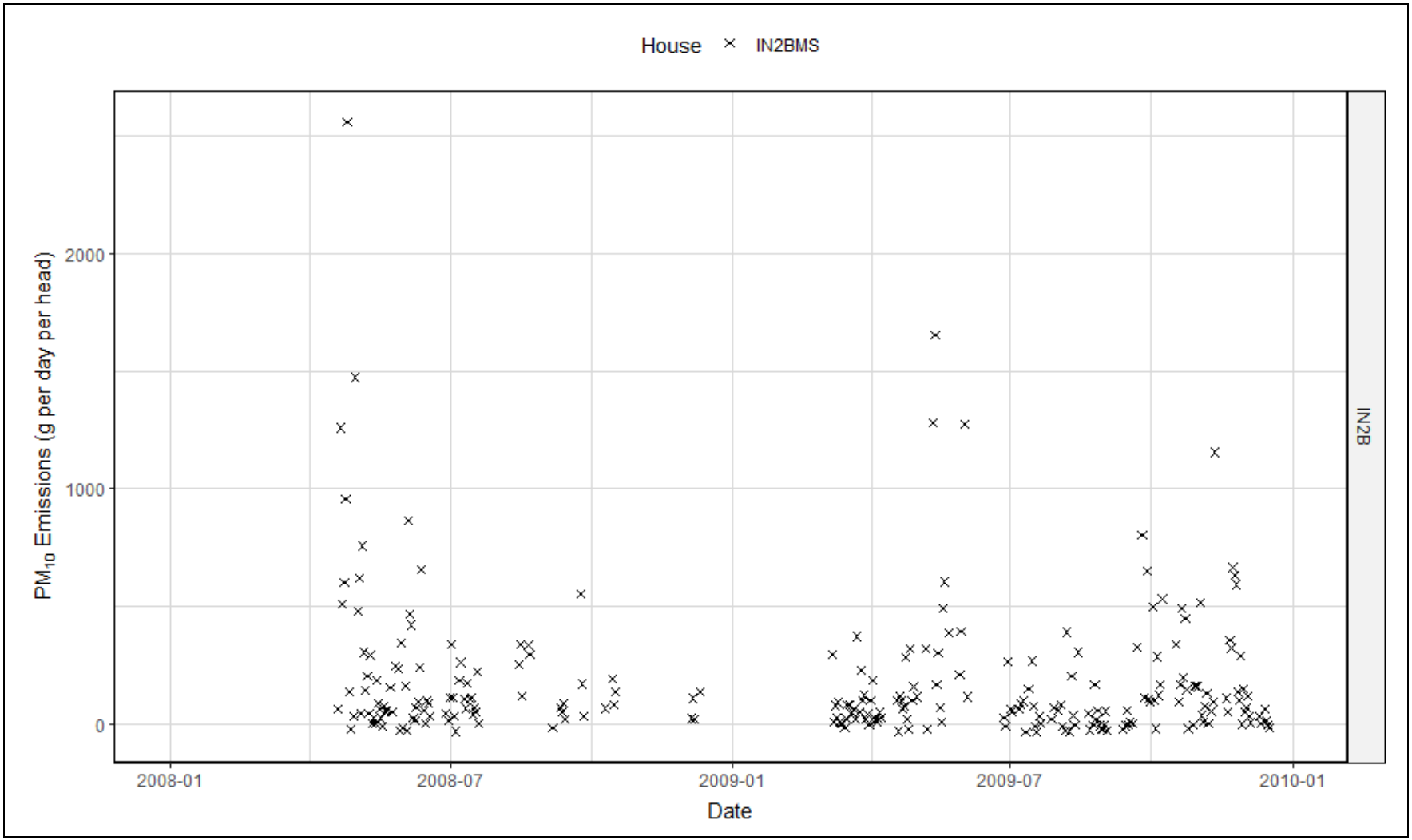

Figure E-41. PM_{10} emission time series for layer manure sheds (g d^{-1}).

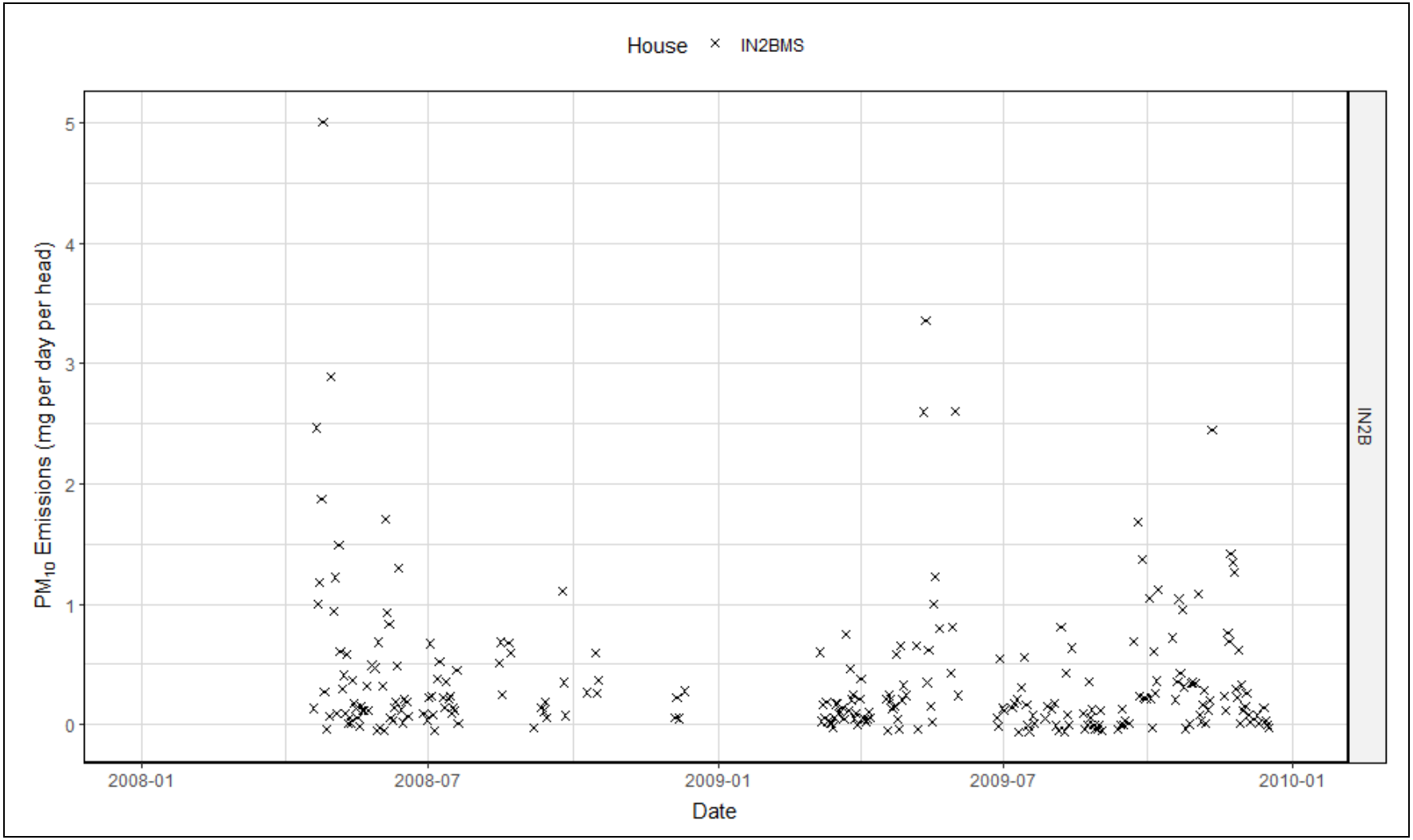

Figure E-42. PM_{10} emission time series for layer manure sheds (mg $d^{-1}hd^{-1}$).

3.1.4 Particulate Matter ($PM_{2.5}$)

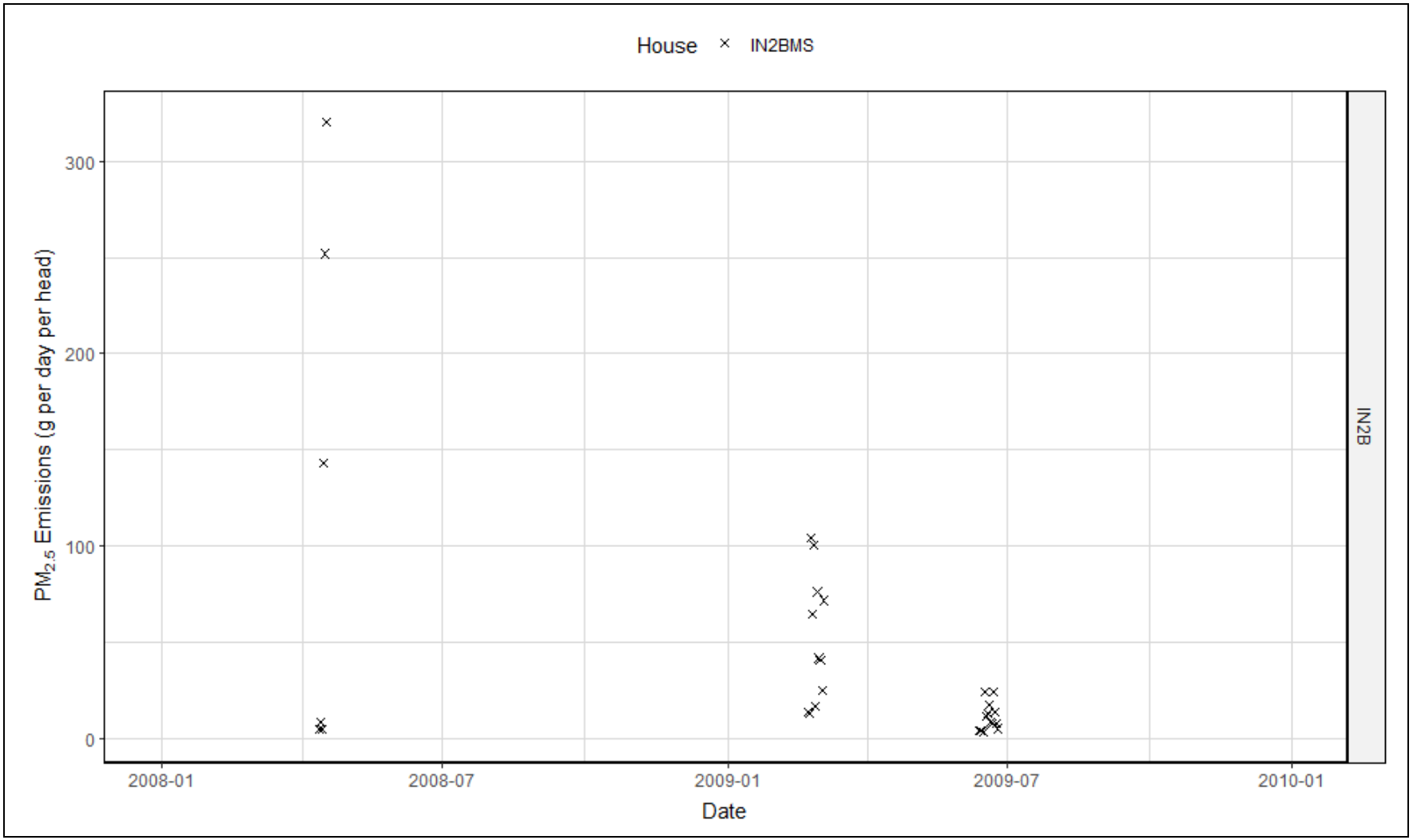

Figure E-43. $PM_{2.5}$ emission time series for layer manure sheds (g d^{-1}).

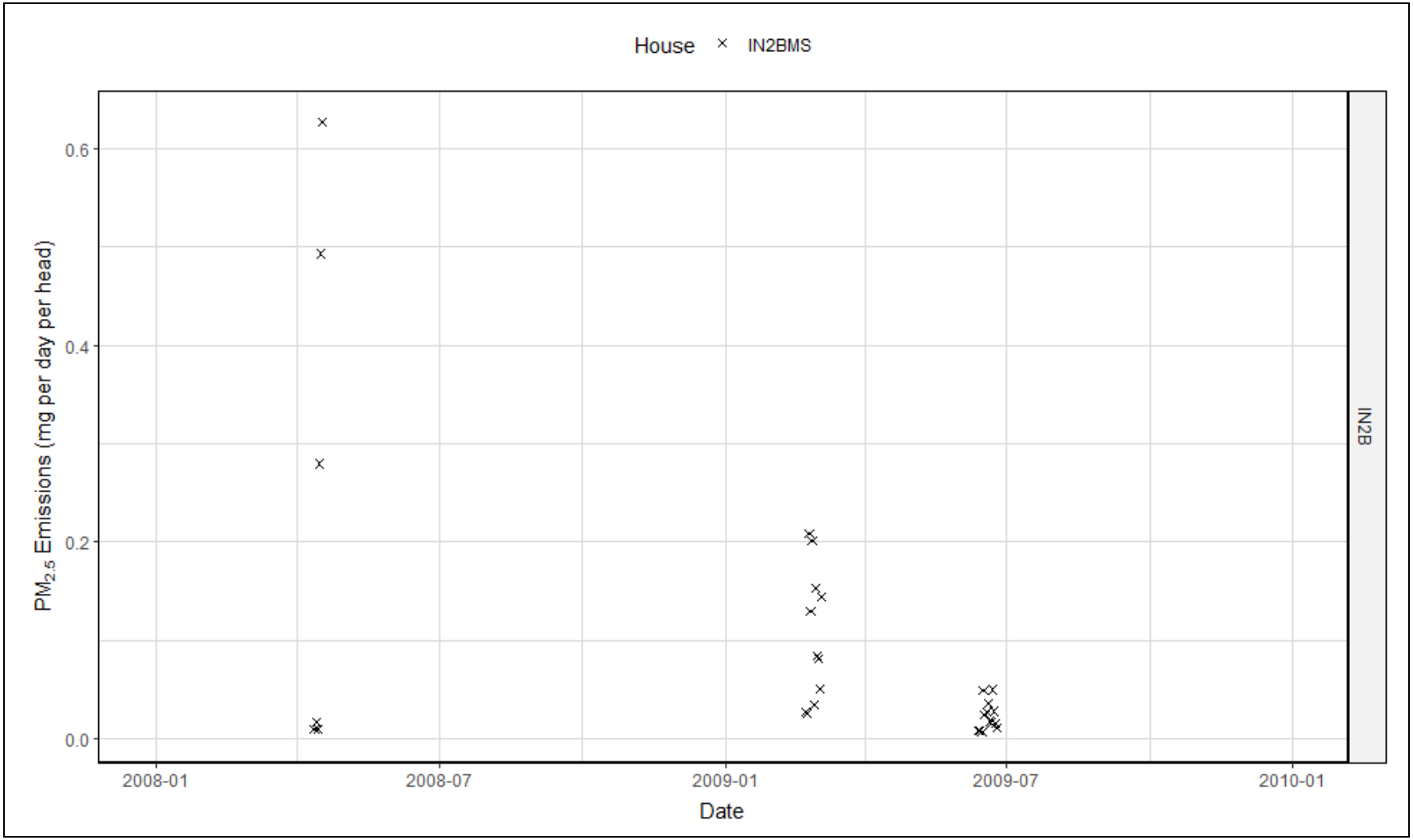

Figure E-44. $PM_{2.5}$ emission time series for layer manure sheds (mg $d^{-1}hd^{-1}$).

3.1.5 Total Suspended Paticulates (TSP)

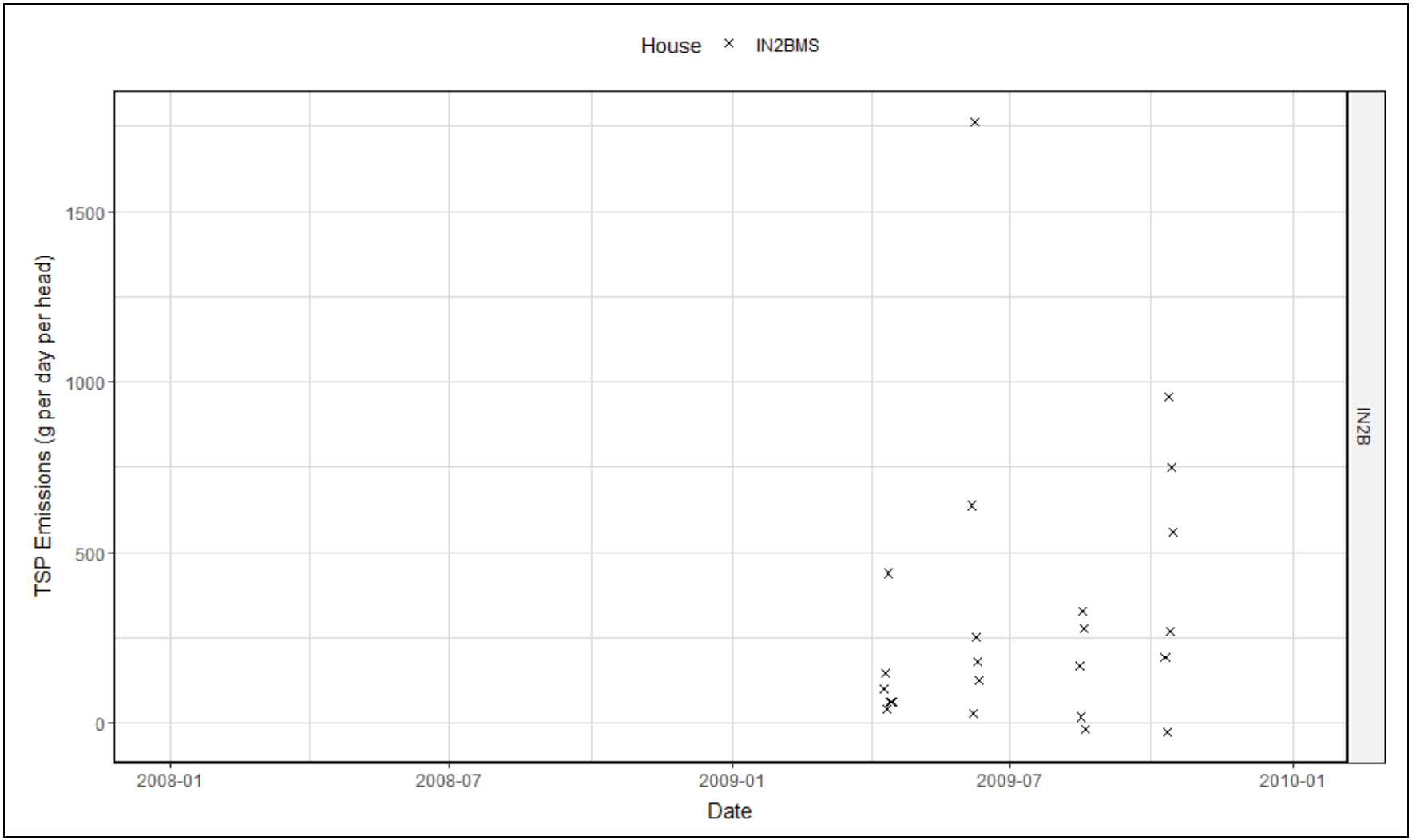

Figure E-45. TSP emission time series for layer manure sheds (g d^{-1}).

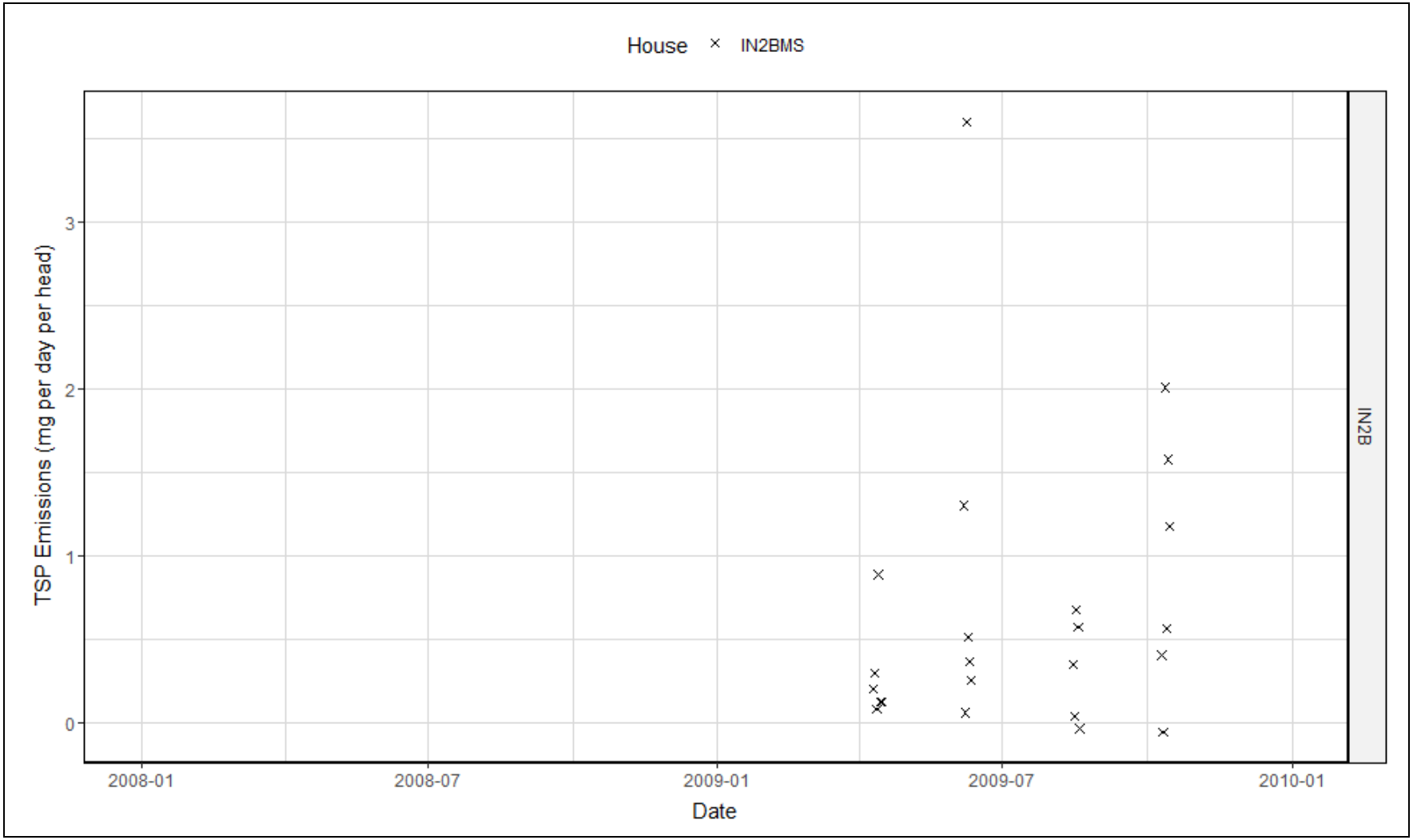

Figure E-46. TSP emission time series for layer manure sheds (mg $d^{-1}hd^{-1}$).

3.2 Environmental

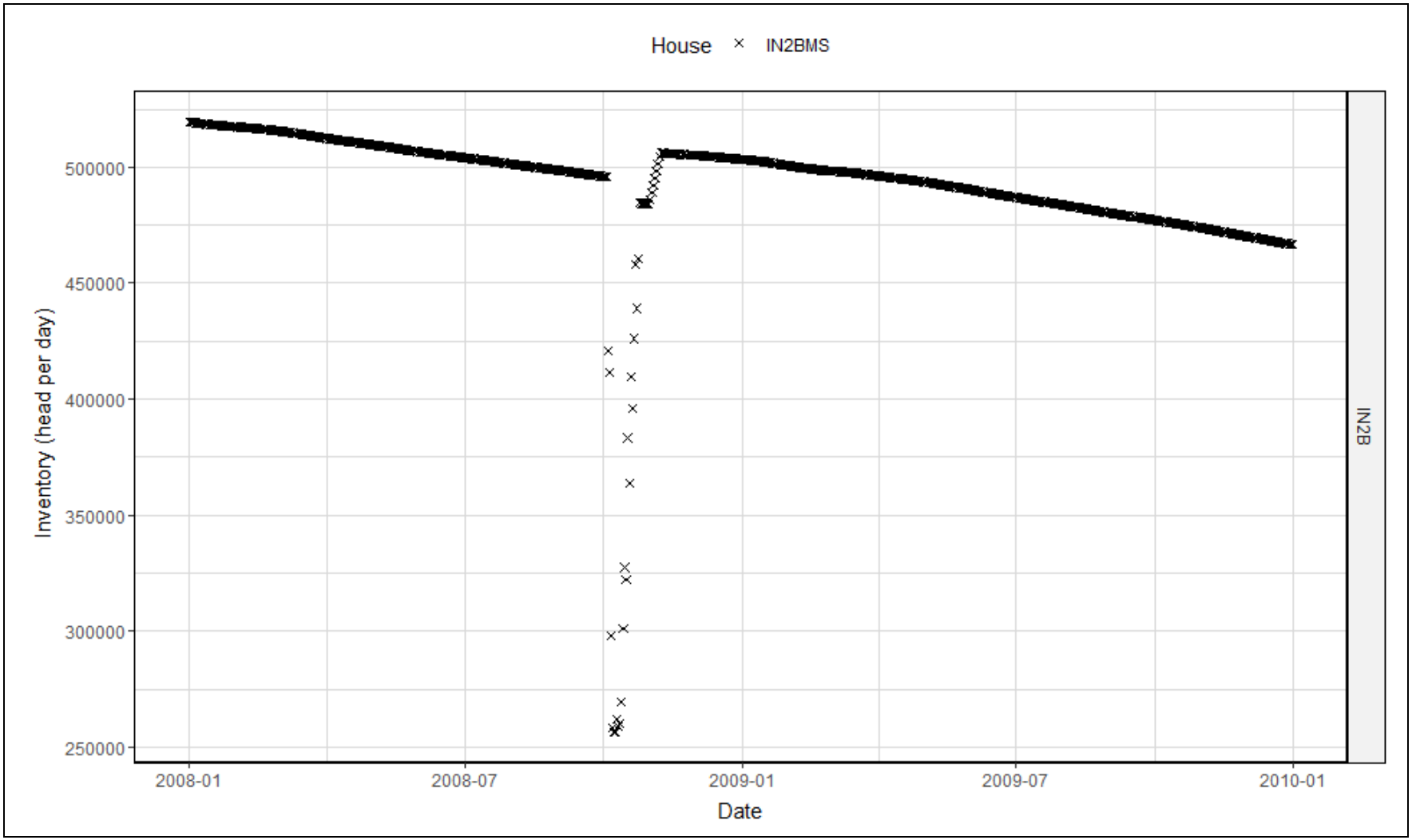

Figure E-47. Inventory time series for layer manure sheds (hd).

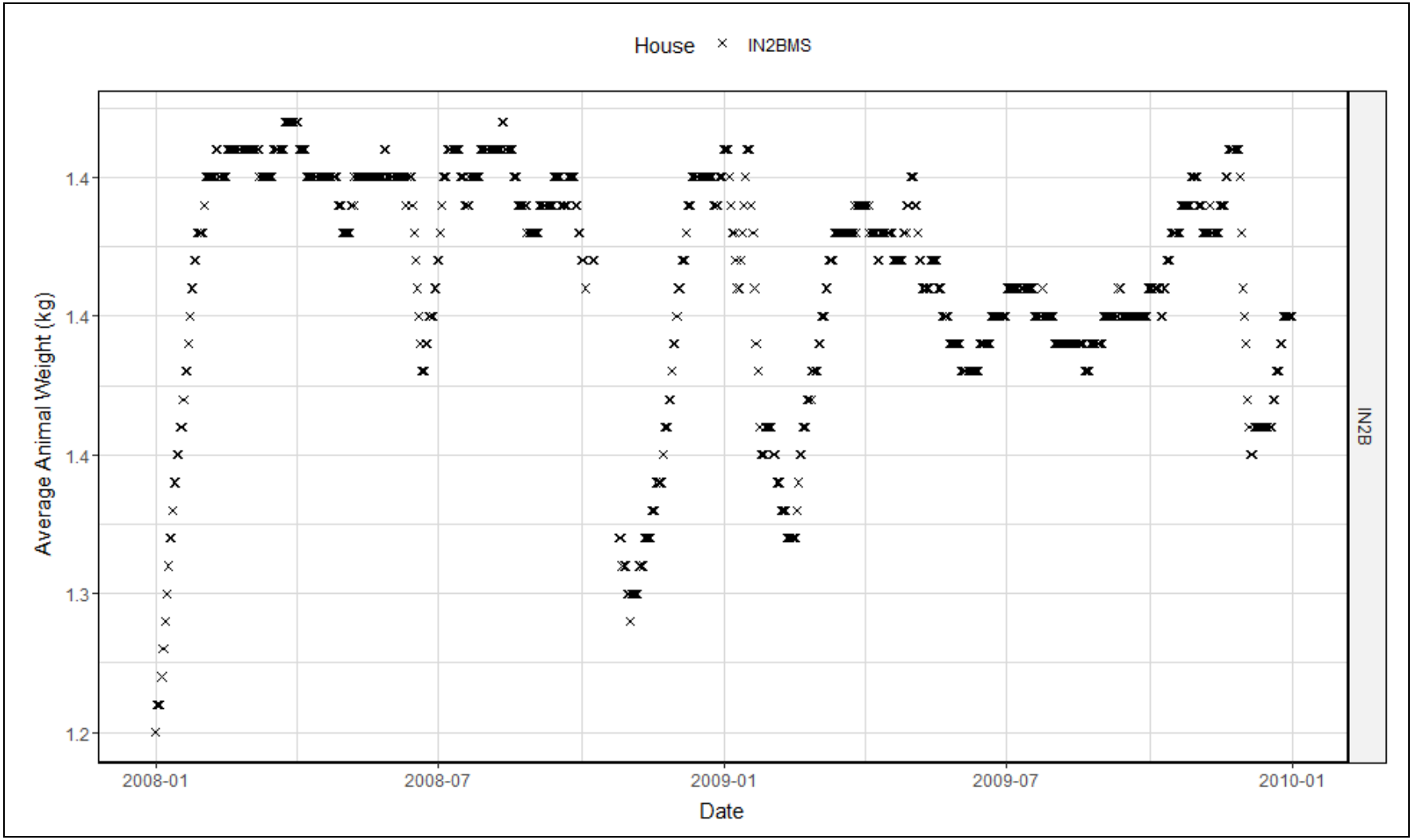

Figure E-48. Average animal weight emission time series for layer manure sheds (kg).

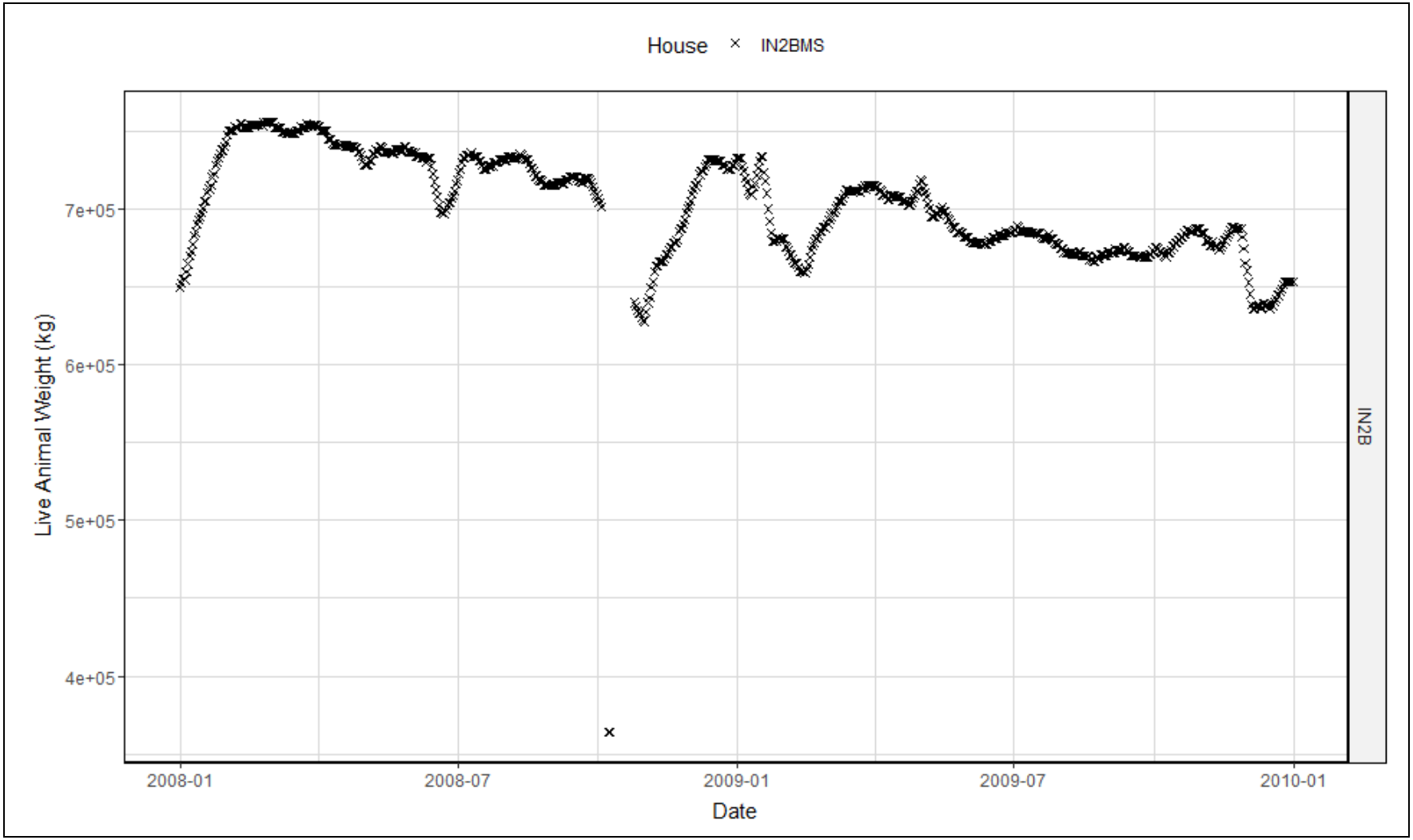

Figure E-49. Live animal weight time series for layer manure sheds (kg).

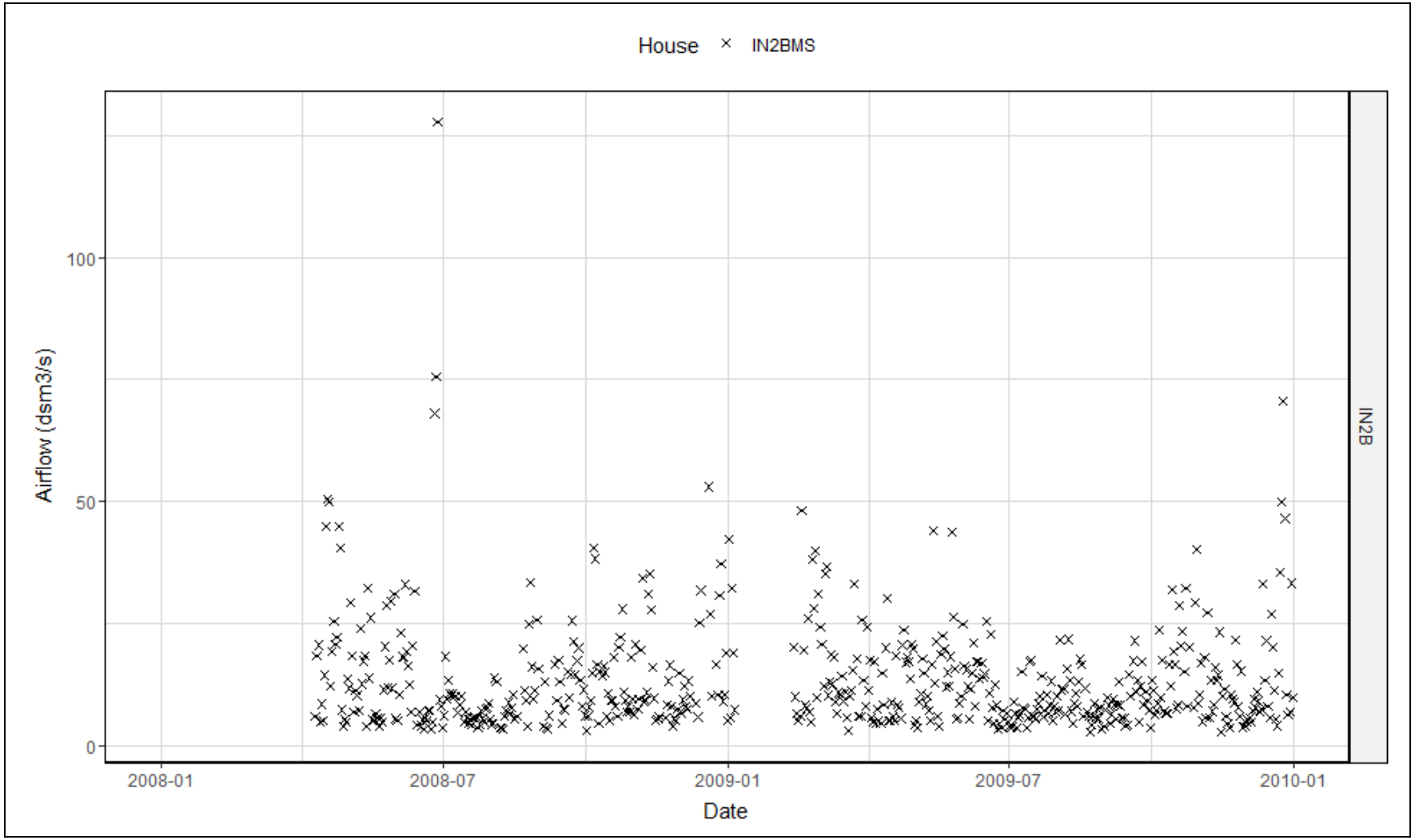

Figure E-50. Airflow time series for layer manure sheds ($dscm^3s^{-1}$).

3.3 Ambient

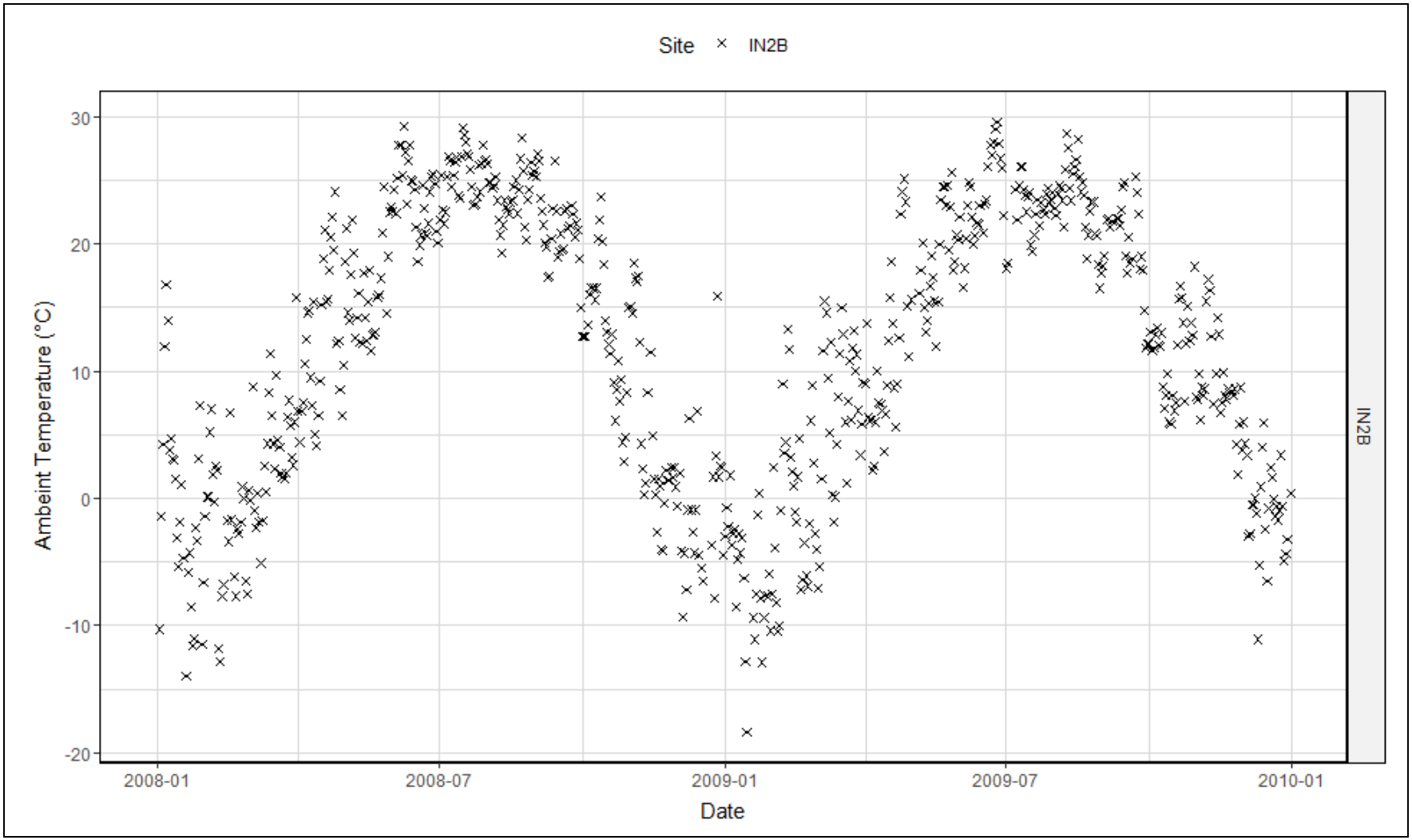

Figure E-51. Ambient temperature time series for layer manure sheds (°C).

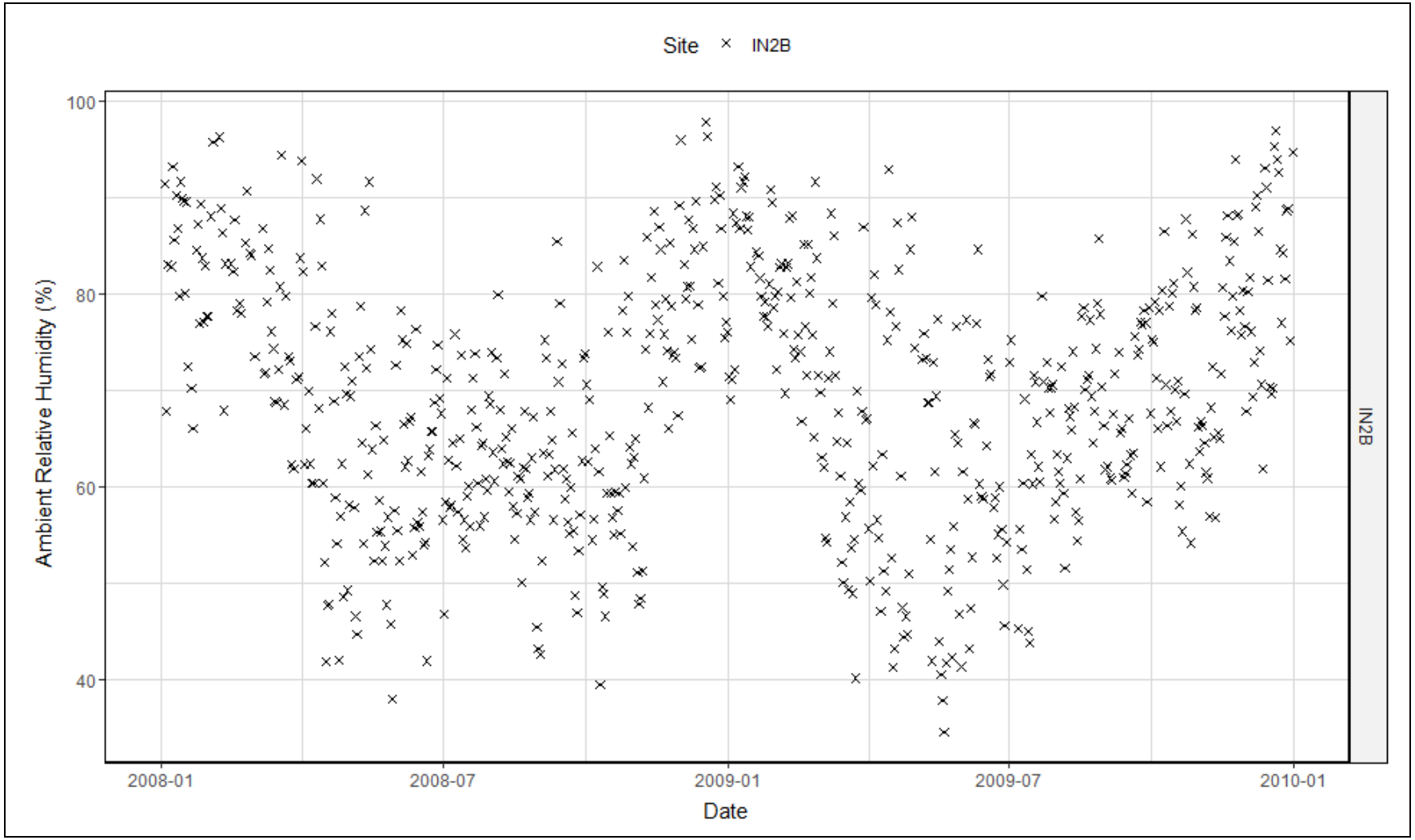

Figure E-52. Ambient relative humidity time series for layer manure sheds (%).

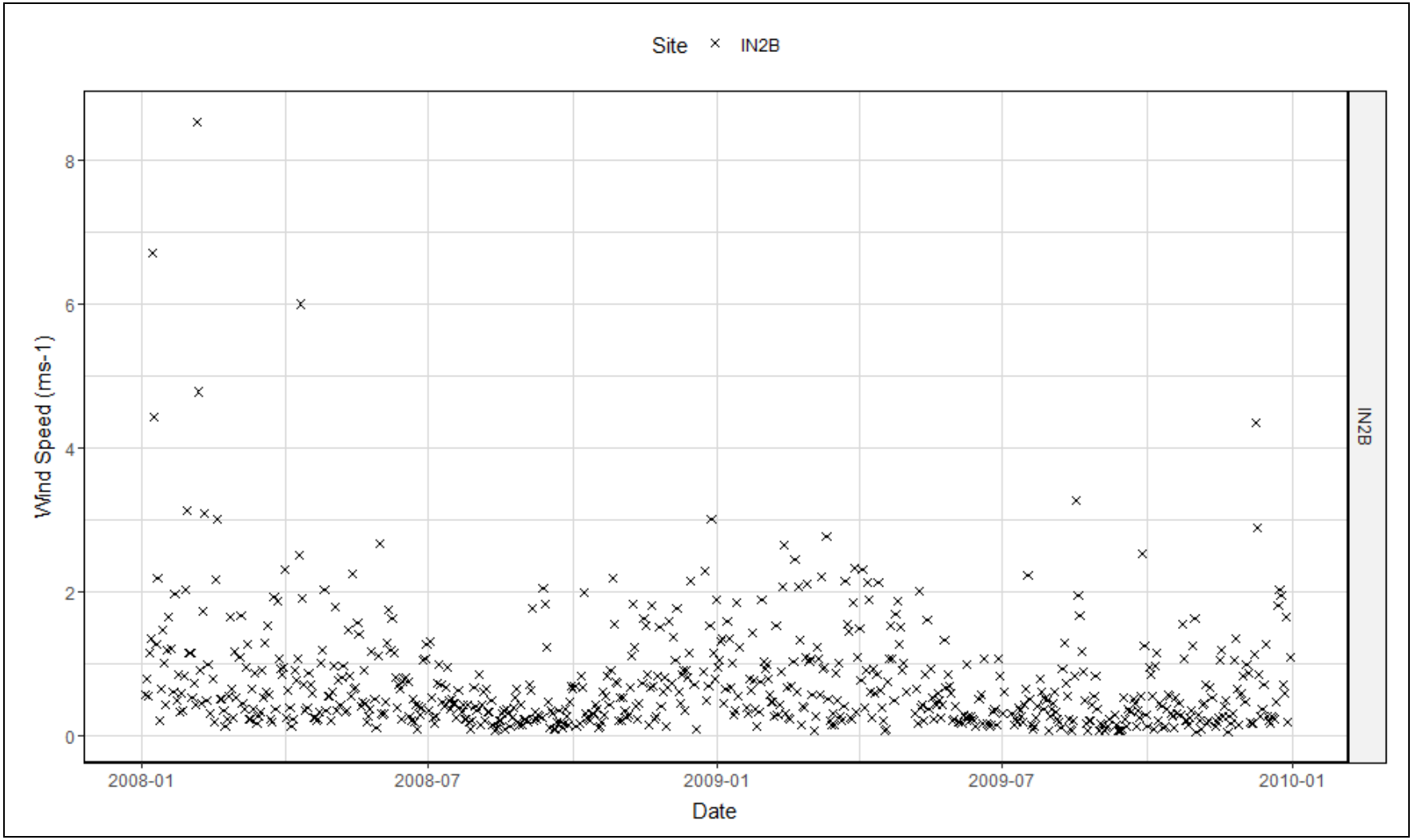

Figure E-53. Barometric pressure time series for layer manure sheds (kPa).

Appendix F: Scatter Plots

2024-09-23

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1 High Rise Houses

1.1 Environmental

Table 1.1: Summary of layer high rise house R^{-2} values for environmental parameters.

Emissions	Parameter	R	R^2	Strength
NH_3 (kgd^{-1})	Inventory (hd)	0.83	0.69	moderately strong
NH_3 ($gd^{-1}hd^{-1}$)	Inventory (hd)	0.09	0.01	slight or weak
NH_3 (kgd^{-1})	Average weight (kg)	-0.32	0.1	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Average weight (kg)	0.11	0.01	slight or weak
NH_3 (kgd^{-1})	Live animal weight (kg)	0.83	0.7	moderately strong
NH_3 ($gd^{-1}hd^{-1}$)	Live animal weight (kg)	0.1	0.01	slight or weak
NH_3 (kgd^{-1})	Exhaust Temperature (C)	-0.18	0.03	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Exhaust Temperature (C)	-0.22	0.05	slight or weak
NH_3 (kgd^{-1})	Exhaust Relative humidity (%)	-0.41	0.17	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	-0.03	0	slight or weak
NH_3 (kgd^{-1})	Airflow (dsm^3s^{-1})	0.23	0.05	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	-0.03	0	slight or weak
PM_{10} (gd^{-1})	Inventory (hd)	0.55	0.3	modest
PM_{10} ($mgd^{-1}hd^{-1}$)	Inventory (hd)	-0.14	0.02	slight or weak
PM_{10} (gd^{-1})	Average weight (kg)	-0.46	0.22	modest
PM_{10} ($mgd^{-1}hd^{-1}$)	Average weight (kg)	-0.06	0	slight or weak
PM_{10} (gd^{-1})	Live animal weight (kg)	0.52	0.27	modest
PM_{10} ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	-0.15	0.02	slight or weak
PM_{10} (gd^{-1})	Exhaust Temperature (C)	0.19	0.04	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	0.17	0.03	slight or weak
PM_{10} (gd^{-1})	Exhaust Relative humidity (%)	-0.32	0.1	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	-0.09	0.01	slight or weak
PM_{10} (gd^{-1})	Airflow (dsm^3s^{-1})	0.51	0.26	modest
PM_{10} ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	0.06	0	slight or weak
$PM_{2.5}$ (gd^{-1})	Inventory (hd)	-0.06	0	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Inventory (hd)	-0.23	0.05	slight or weak
$PM_{2.5}$ (gd^{-1})	Average weight (kg)	-0.44	0.19	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Average weight (kg)	-0.44	0.19	slight or weak
$PM_{2.5}$ (gd^{-1})	Live animal weight (kg)	-0.08	0.01	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	-0.26	0.07	slight or weak
$PM_{2.5}$ (gd^{-1})	Exhaust Temperature (C)	0.66	0.43	moderate
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	0.63	0.4	modest
$PM_{2.5}$ (gd^{-1})	Exhaust Relative humidity (%)	-0.17	0.03	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	-0.14	0.02	slight or weak
$PM_{2.5}$ (gd^{-1})	Airflow (dsm^3s^{-1})	0.38	0.14	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	0.23	0.05	slight or weak
H_2S (gd^{-1})	Inventory (hd)	0.61	0.38	modest
H_2S ($mgd^{-1}hd^{-1}$)	Inventory (hd)	0.08	0.01	slight or weak
TSP (gd^{-1})	Inventory (hd)	0.5	0.25	modest
TSP ($mgd^{-1}hd^{-1}$)	Inventory (hd)	-0.48	0.23	modest

Emissions	Parameter	R	R^2	Strength
H_2S (gd^{-1})	Average weight (kg)	-0.23	0.06	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Average weight (kg)	0.15	0.02	slight or weak
TSP (gd^{-1})	Average weight (kg)	-0.46	0.21	modest
TSP ($mgd^{-1}hd^{-1}$)	Average weight (kg)	0.21	0.04	slight or weak
H_2S (gd^{-1})	Live animal weight (kg)	0.61	0.37	modest
H_2S ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	0.08	0.01	slight or weak
TSP (gd^{-1})	Live animal weight (kg)	0.47	0.22	modest
TSP ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	-0.49	0.24	modest
H_2S (gd^{-1})	Exhaust Temperature (C)	0.19	0.04	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	0.11	0.01	slight or weak
TSP (gd^{-1})	Exhaust Temperature (C)	-0.12	0.01	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	0.04	0	slight or weak
H_2S (gd^{-1})	Exhaust Relative humidity (%)	-0.25	0.06	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	-0.05	0	slight or weak
TSP (gd^{-1})	Exhaust Relative humidity (%)	-0.25	0.07	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	-0.17	0.03	slight or weak
H_2S (gd^{-1})	Airflow (dsm^3s^{-1})	0.58	0.34	modest
H_2S ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	0.31	0.1	slight or weak
TSP (gd^{-1})	Airflow (dsm^3s^{-1})	-0.08	0.01	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	-0.26	0.07	slight or weak

1.1.1 Ammonia (NH_3)

1.1.1.1 Inventory

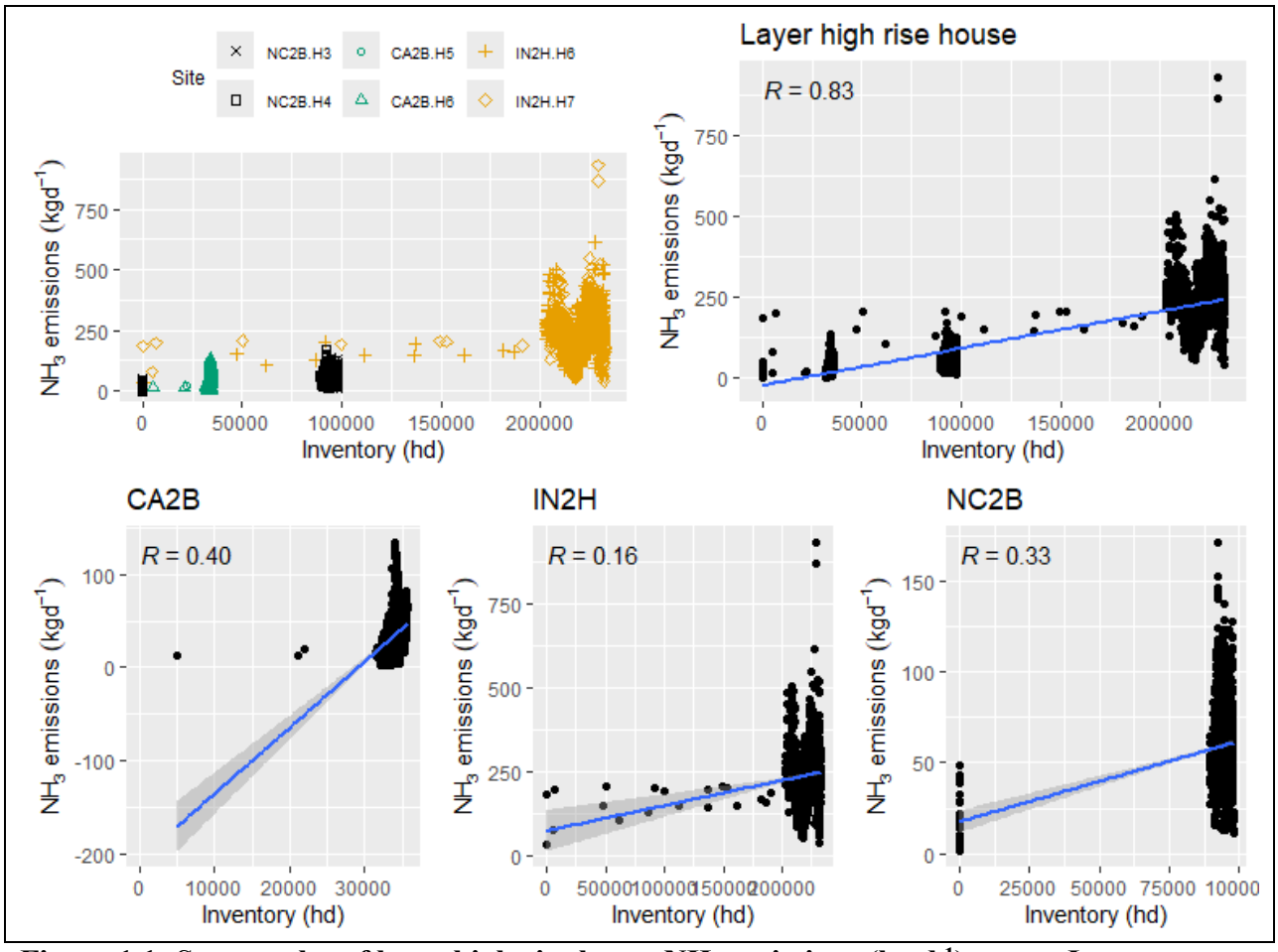

Figure 1.1: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus Inventory.

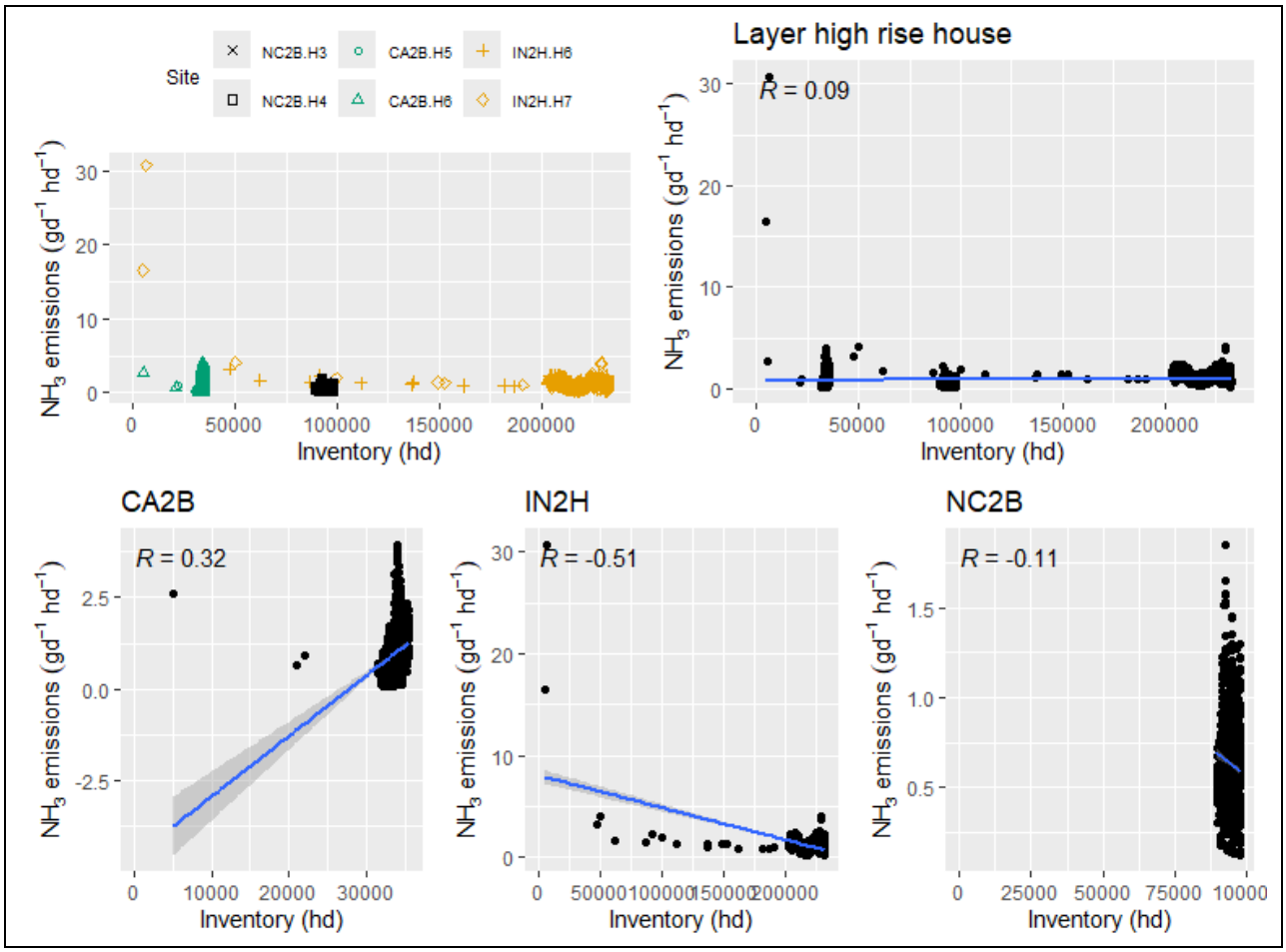

Figure 1.2: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus Inventory.

1.1.1.2 Average animal weight

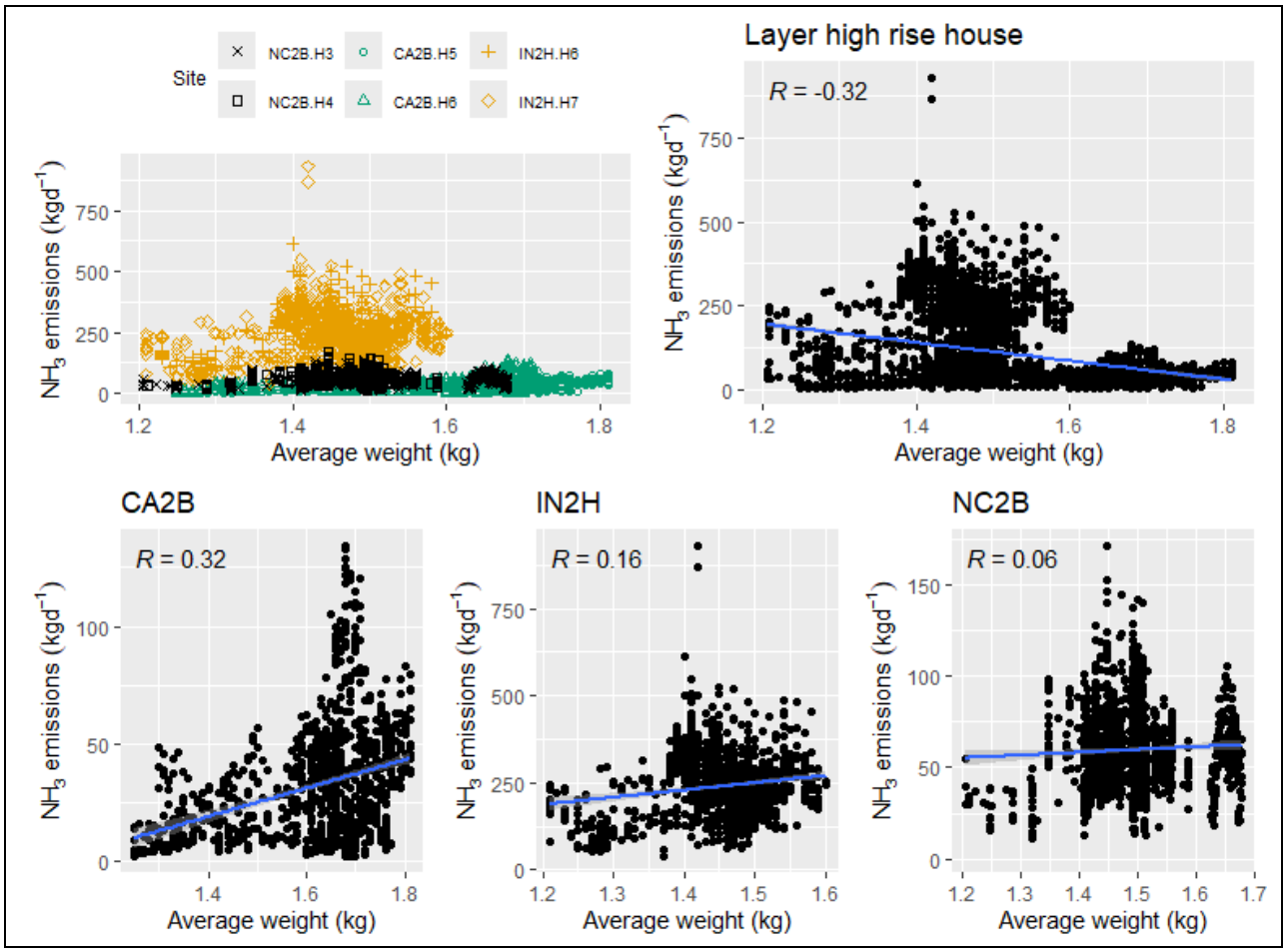

Figure 1.3: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus average animal weight.

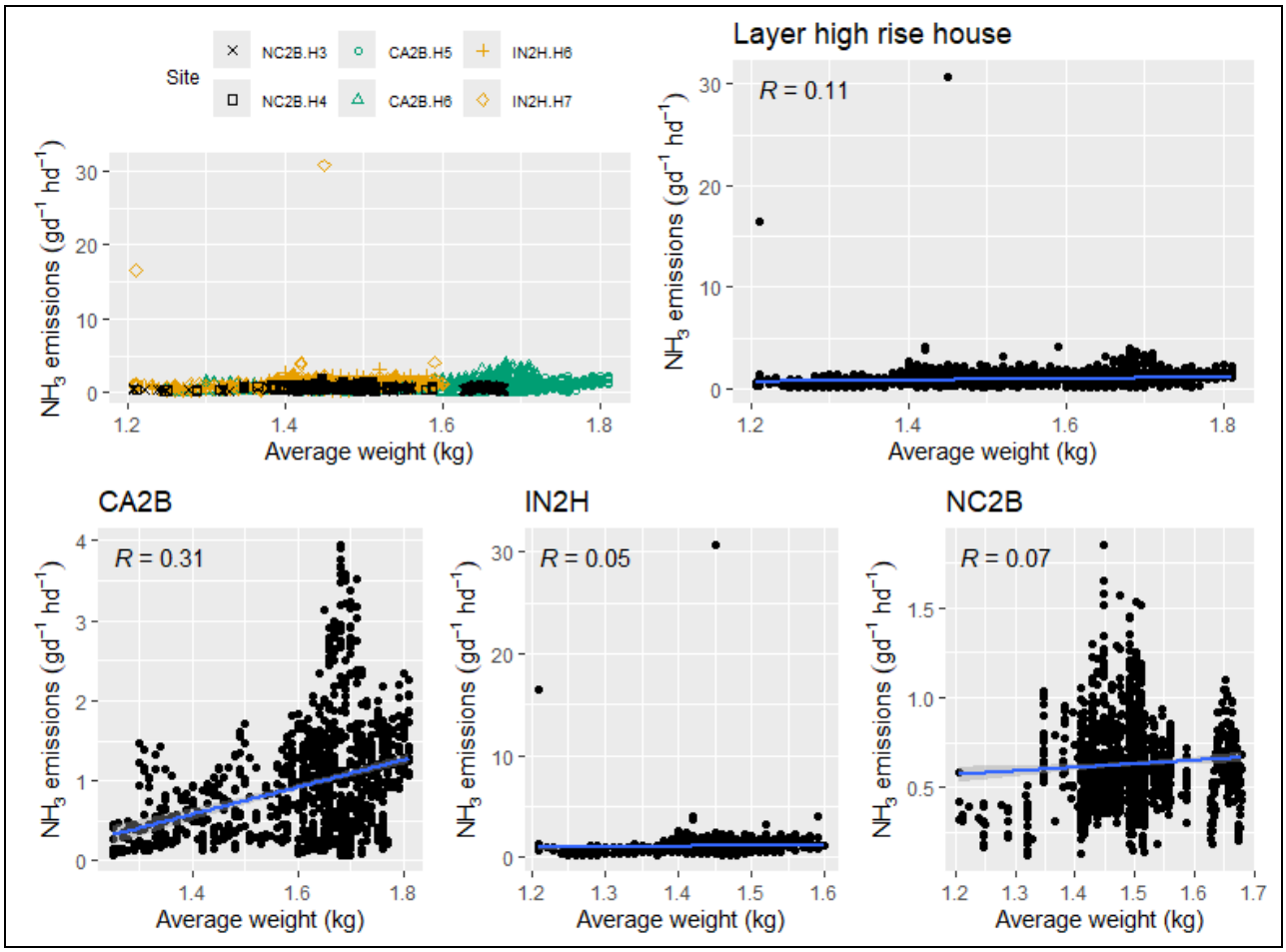

Figure 1.4: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus average animal weight.

1.1.1.3 Live animal weight

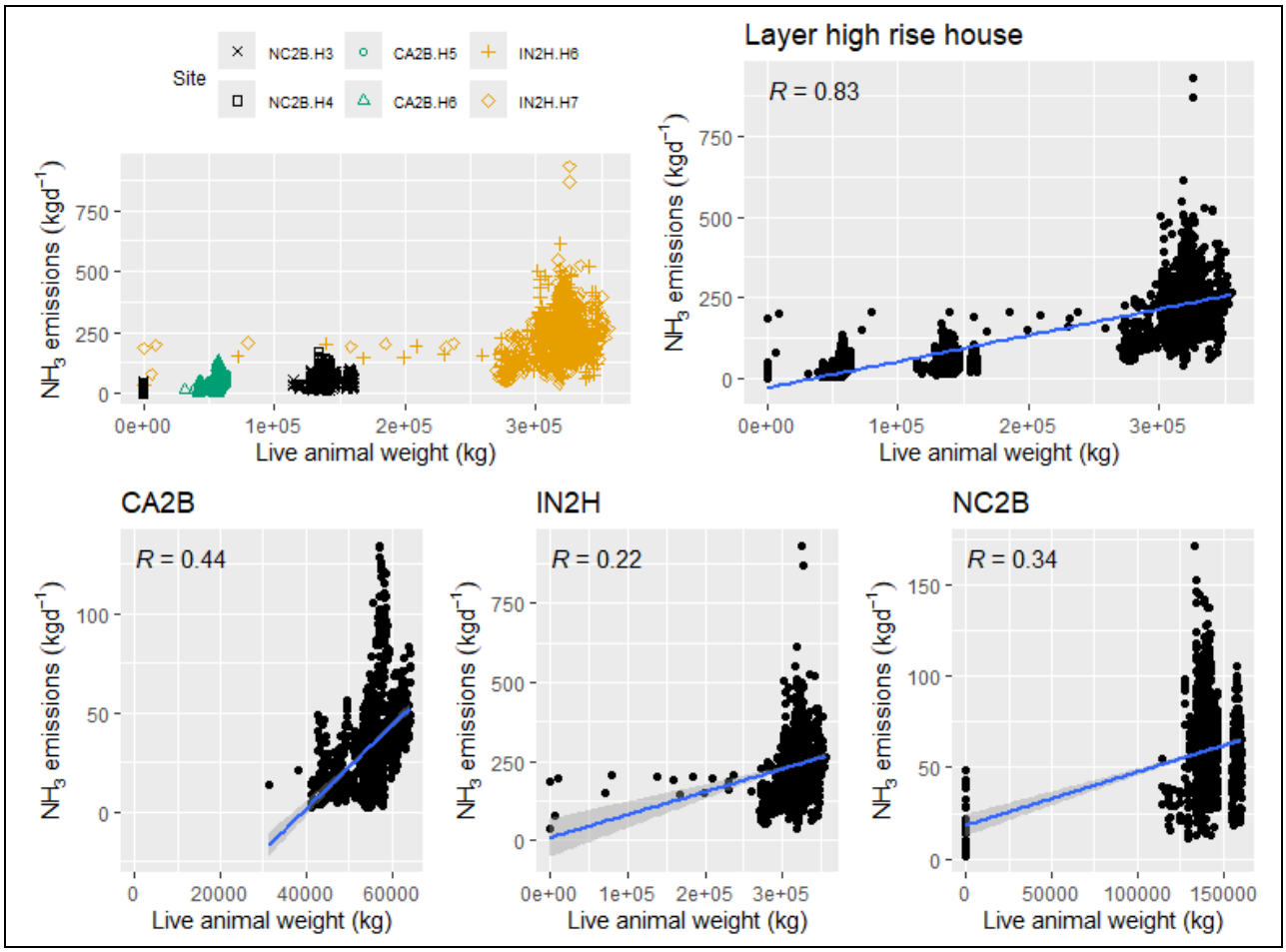

Figure 1.5: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus live animal weight.

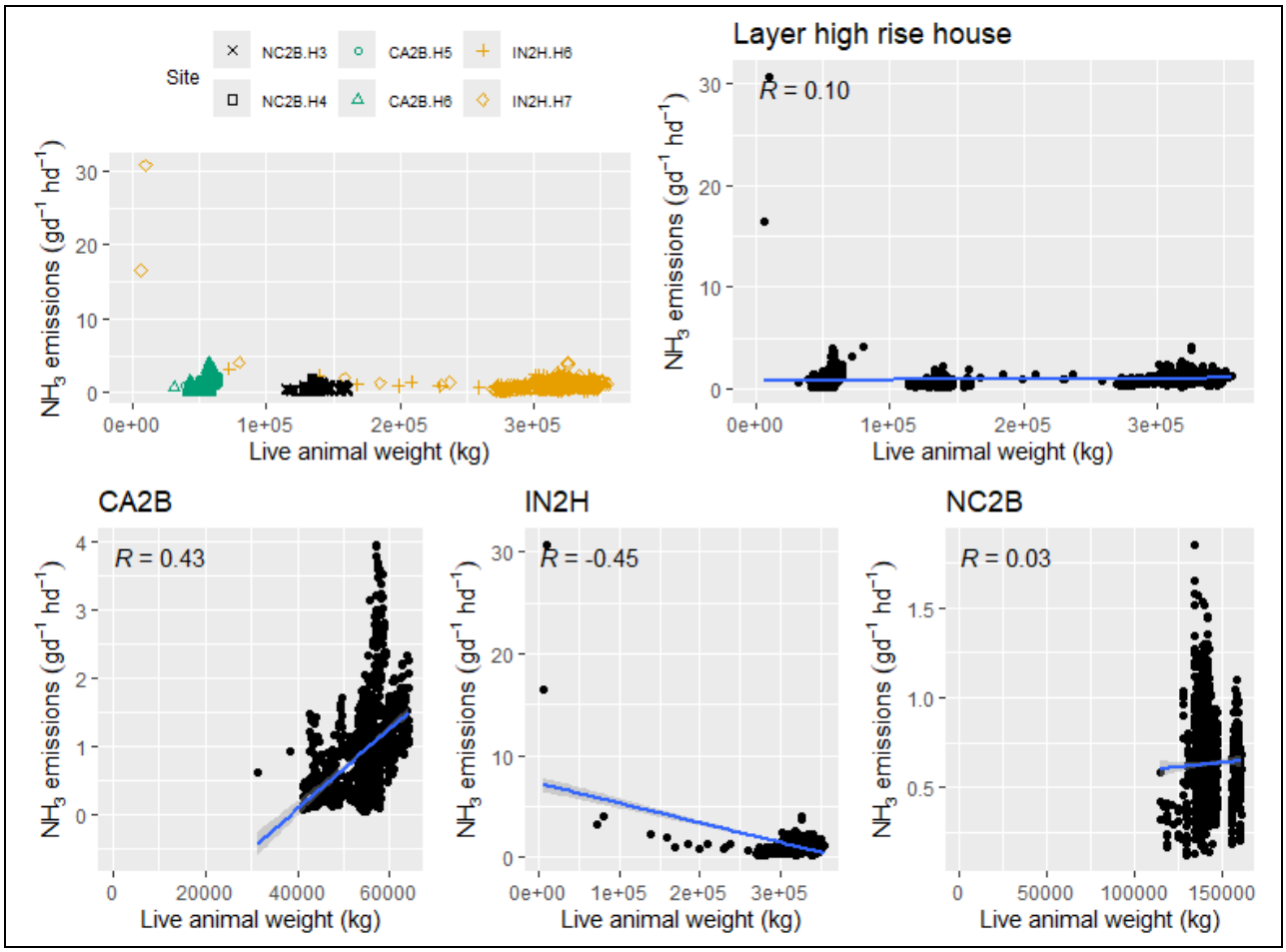

Figure 1.6: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus live animal weight.

1.1.1.4 Exhaust temperature

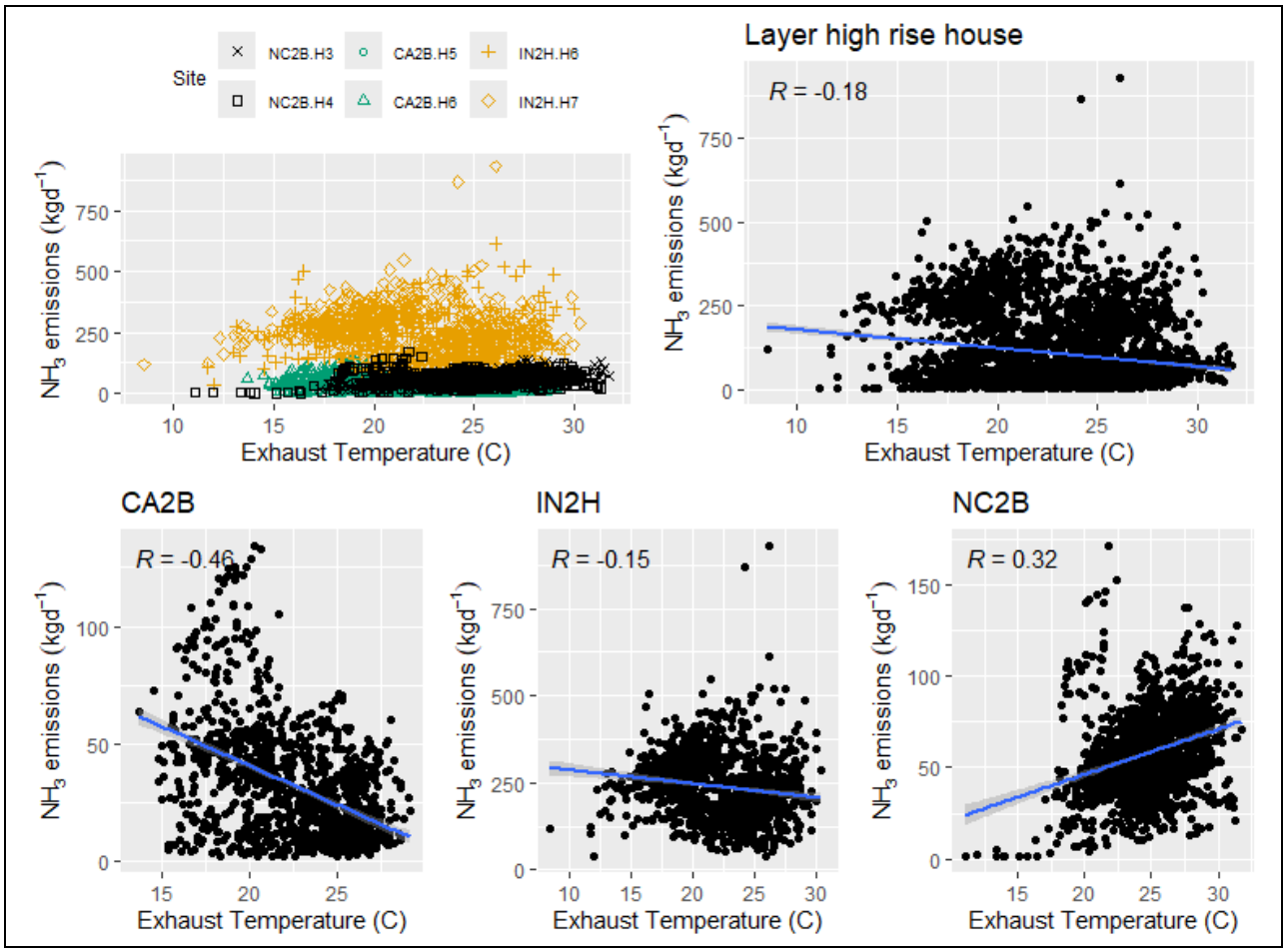

Figure 1.7: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus exhaust temperature.

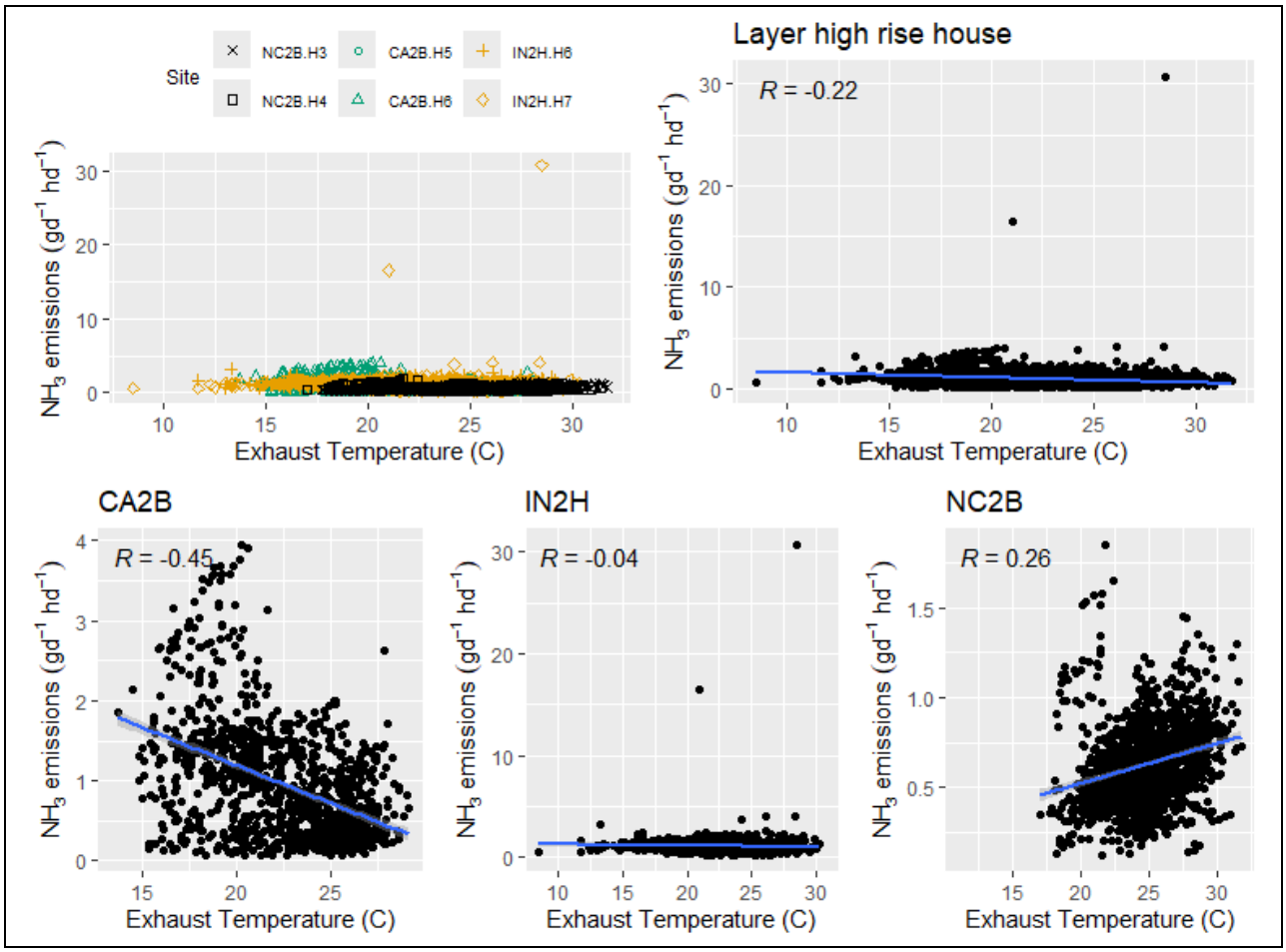

Figure 1.8: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus exhaust temperature.

1.1.1.5 Exhaust relative humidity

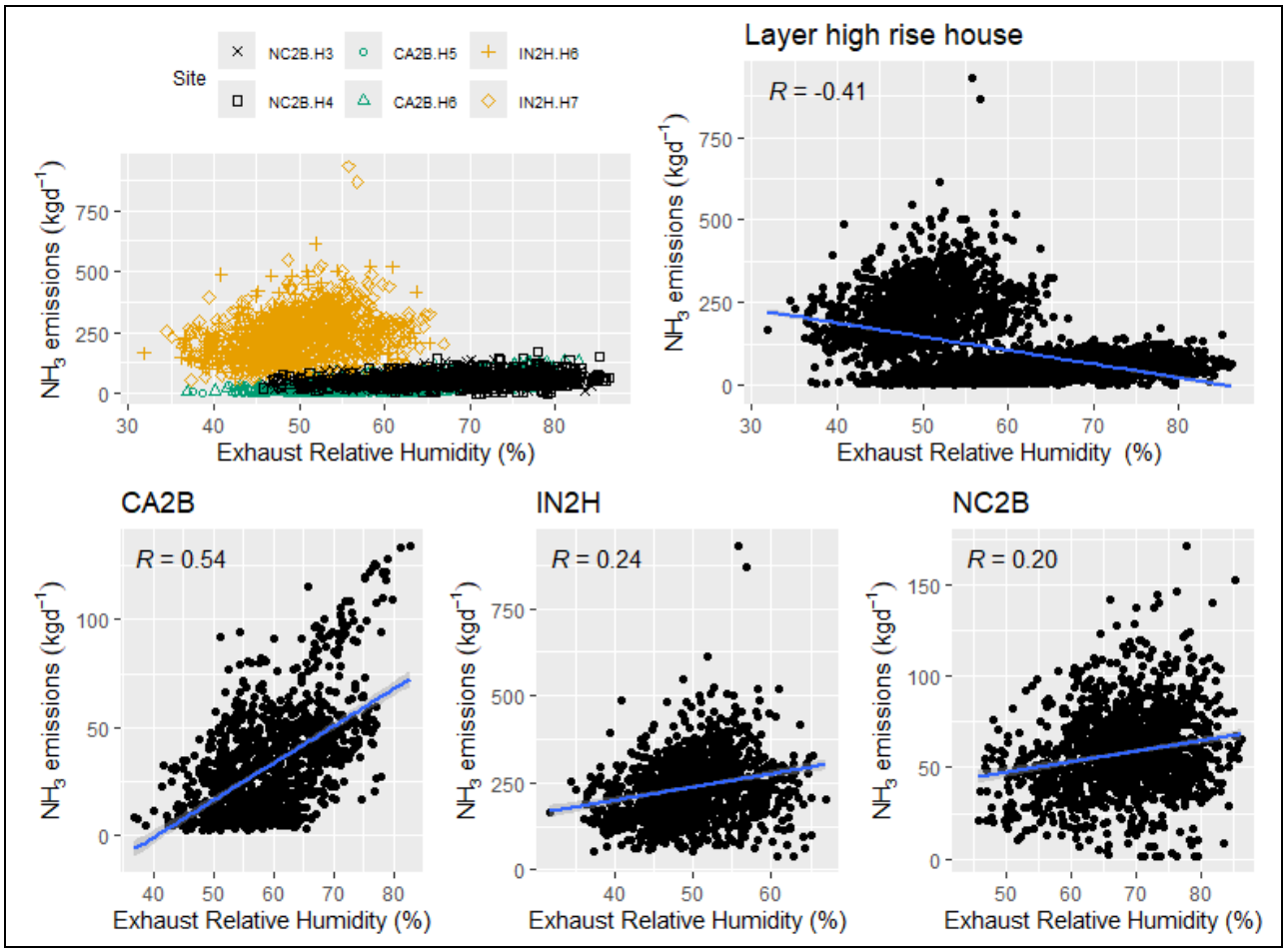

Figure 1.9: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus exhaust relative humidity.

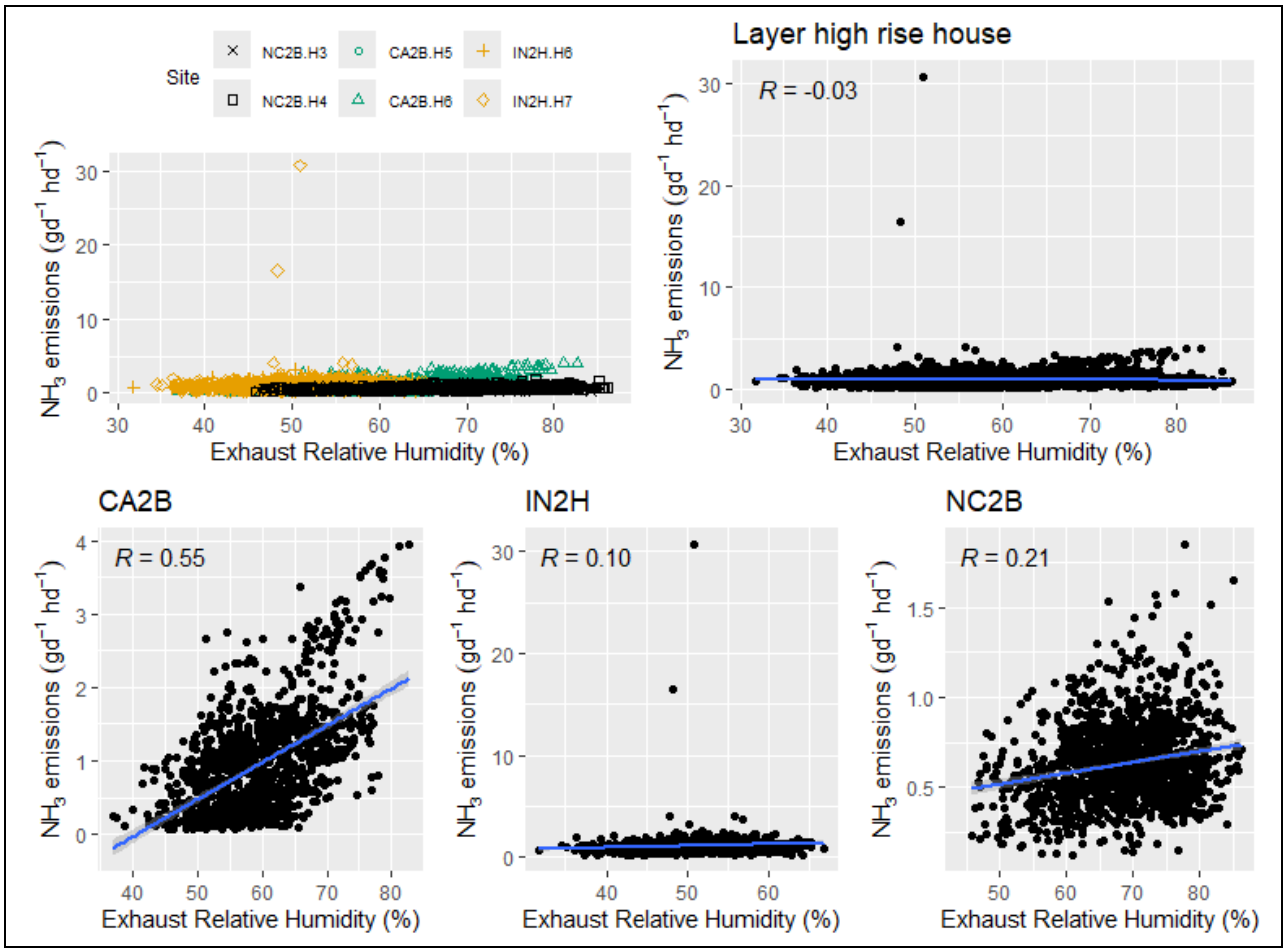

Figure 1.10: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus exhaust relative humidity.

1.1.1.6 Airflow

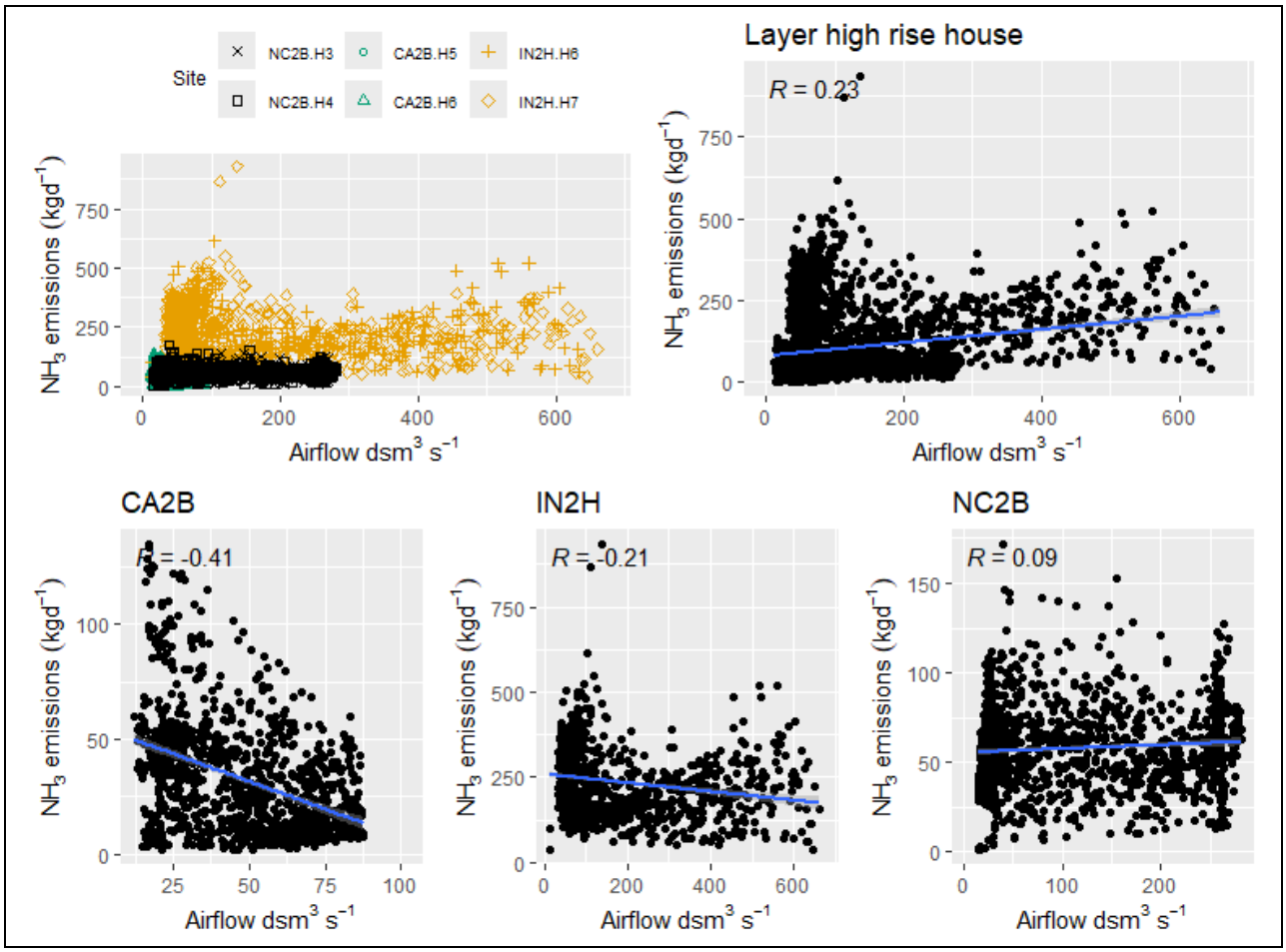

Figure 1.11: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus airflow.

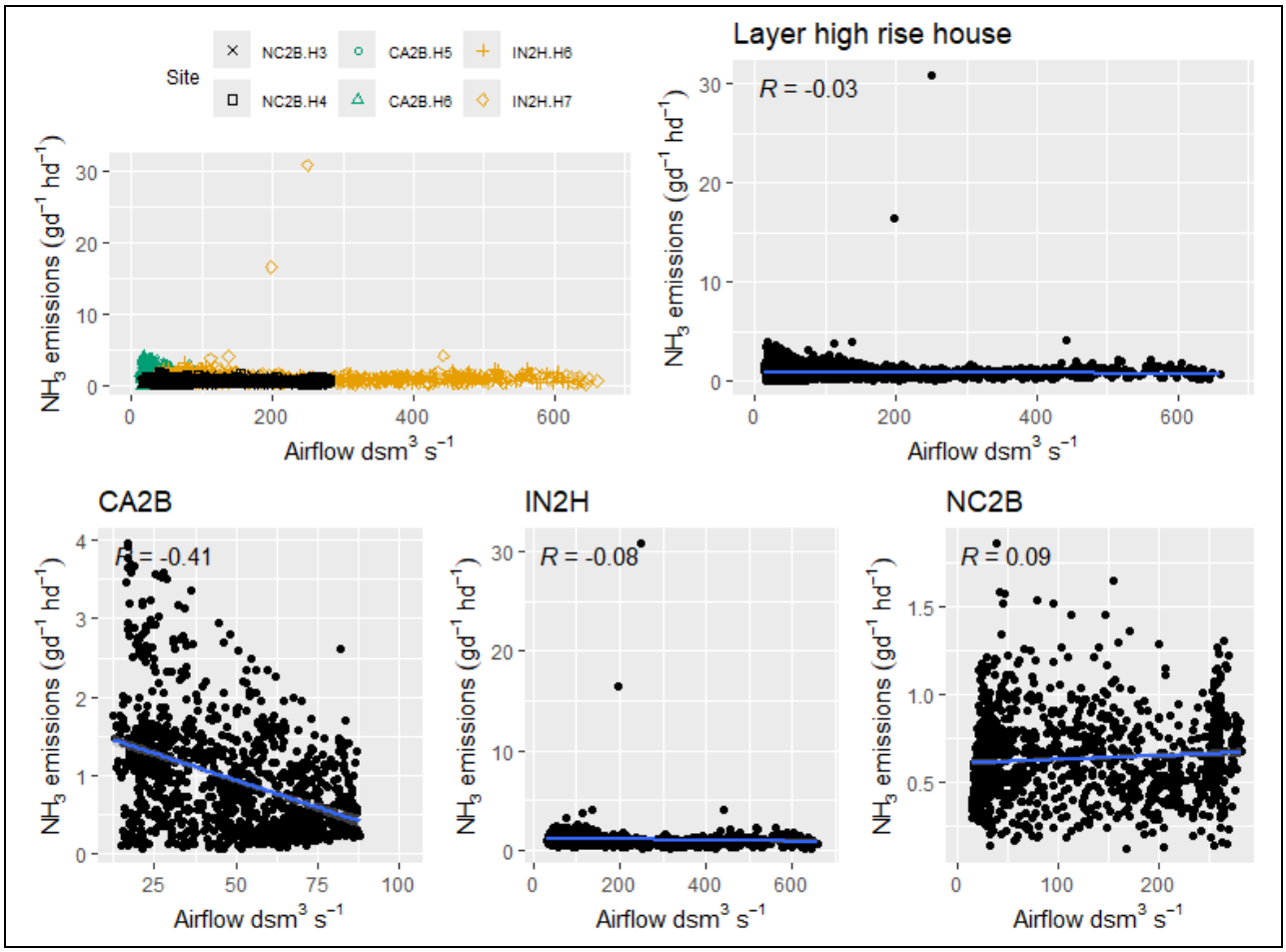

Figure 1.12: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus airflow.

1.1.2 Hydrogen Sulfide (H_2S)

1.1.2.1 Inventory

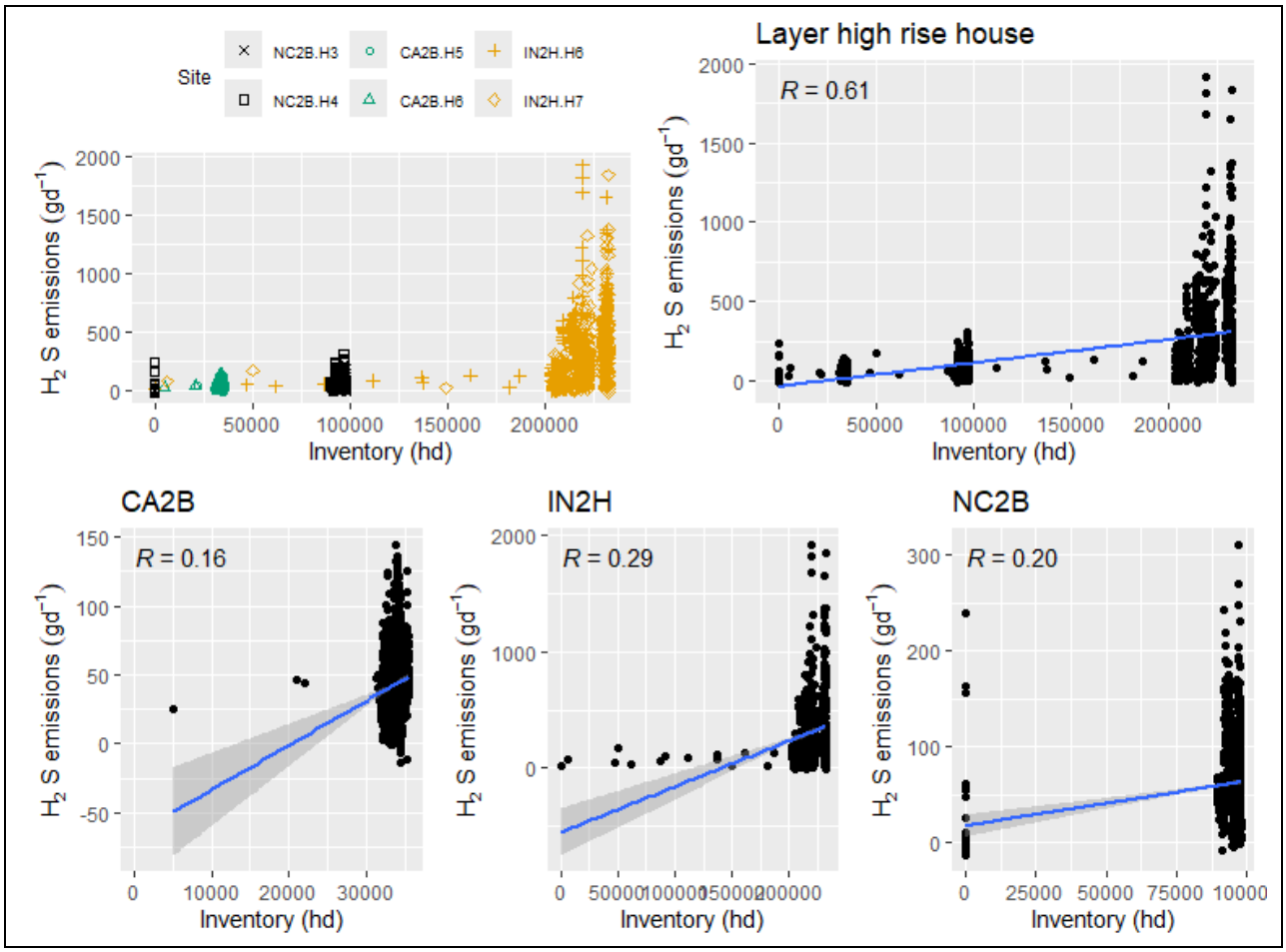

Figure 1.13: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus Inventory.

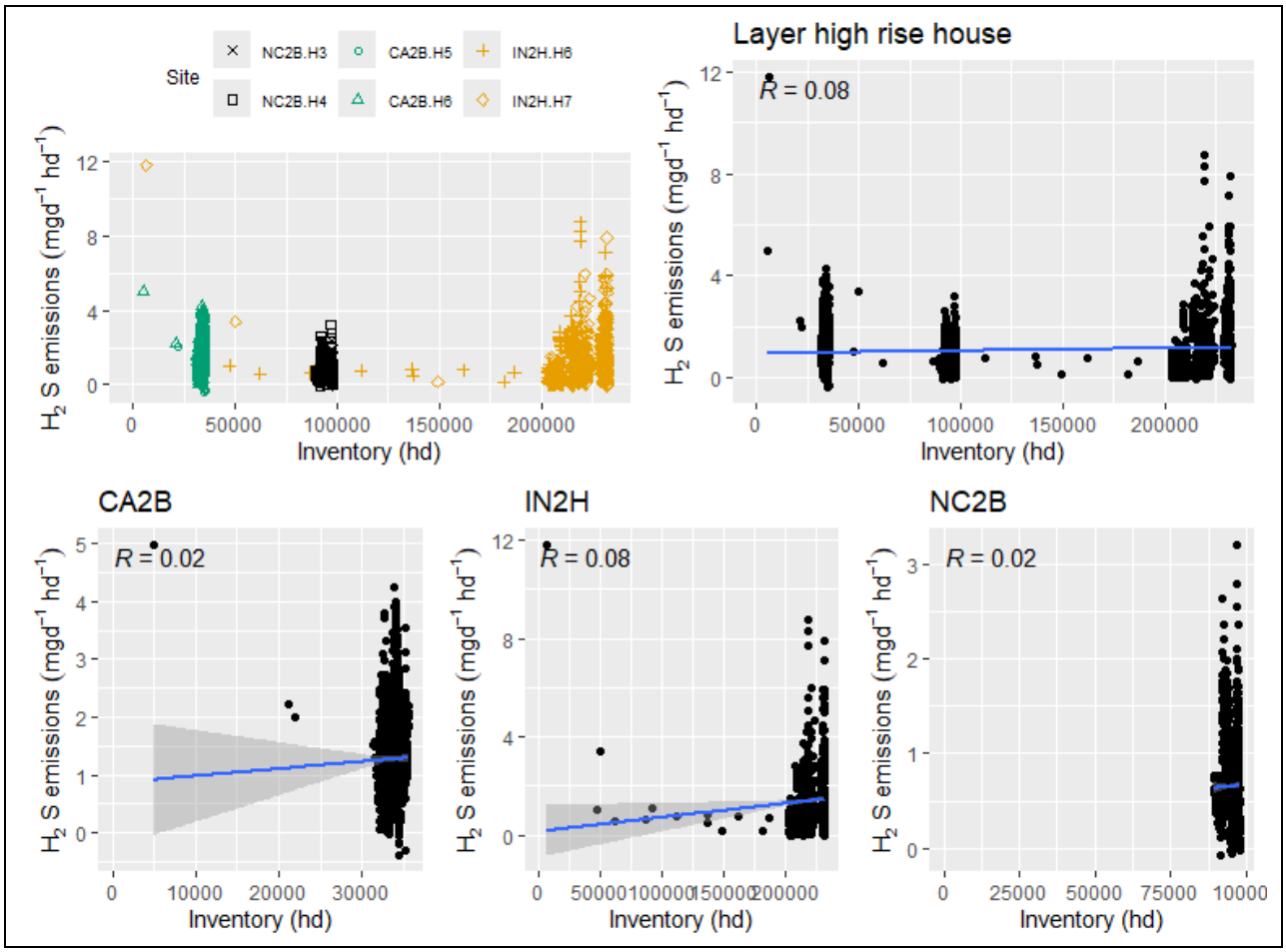

Figure 1.14: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

1.1.2.2 Average animal weight

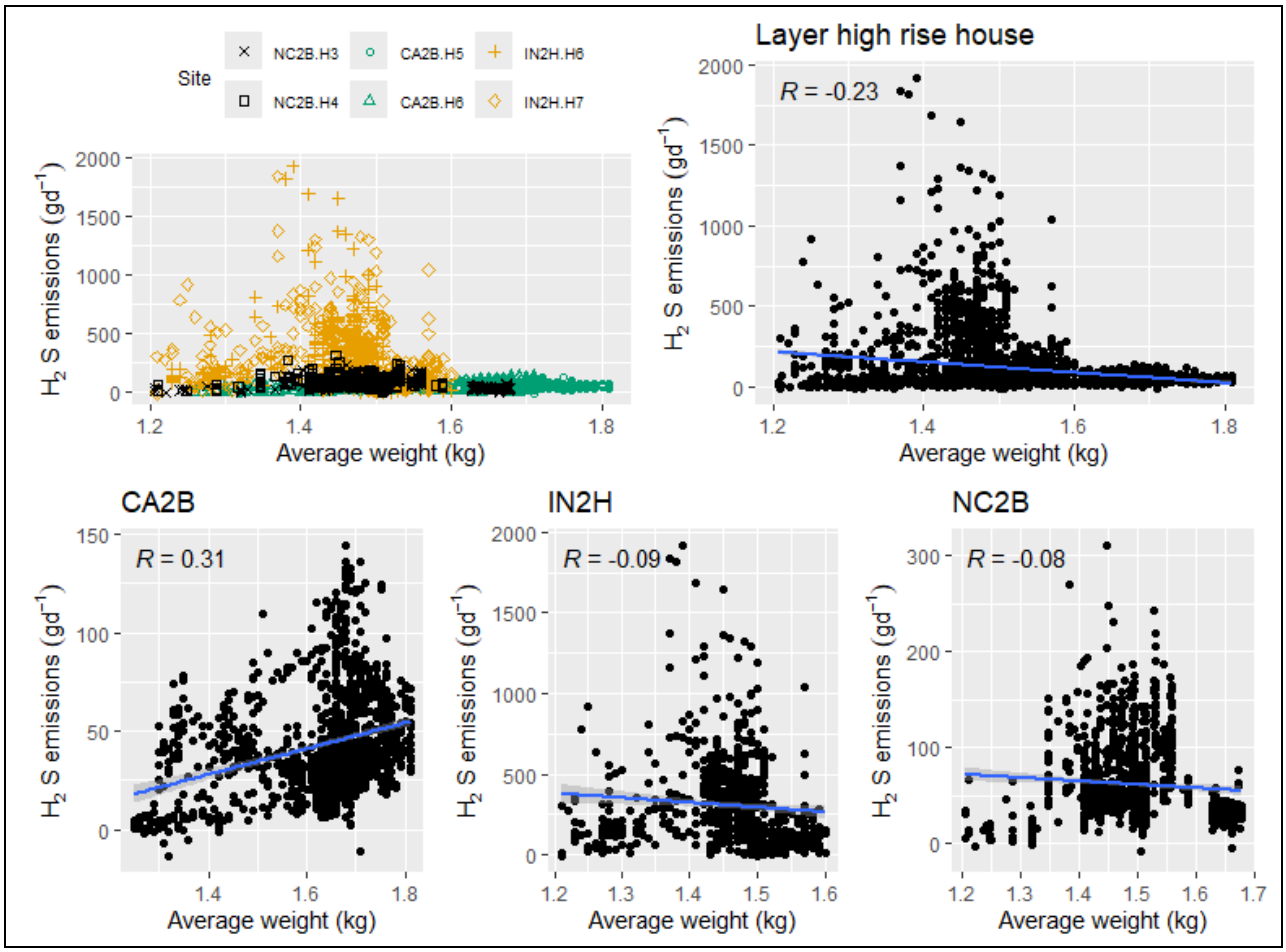

Figure 1.15: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus average animal weight.

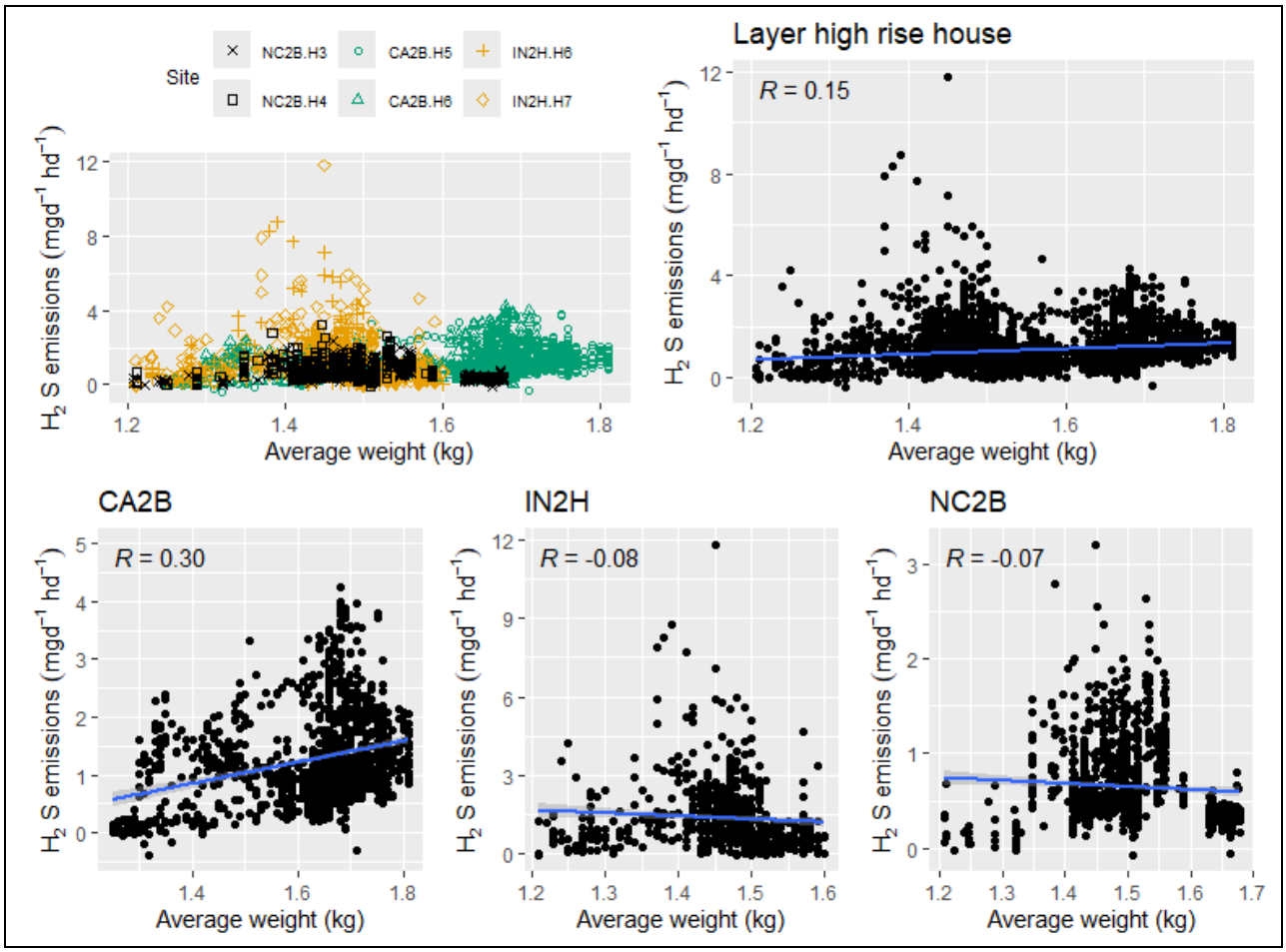

Figure 1.16: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

1.1.2.3 Live animal weight

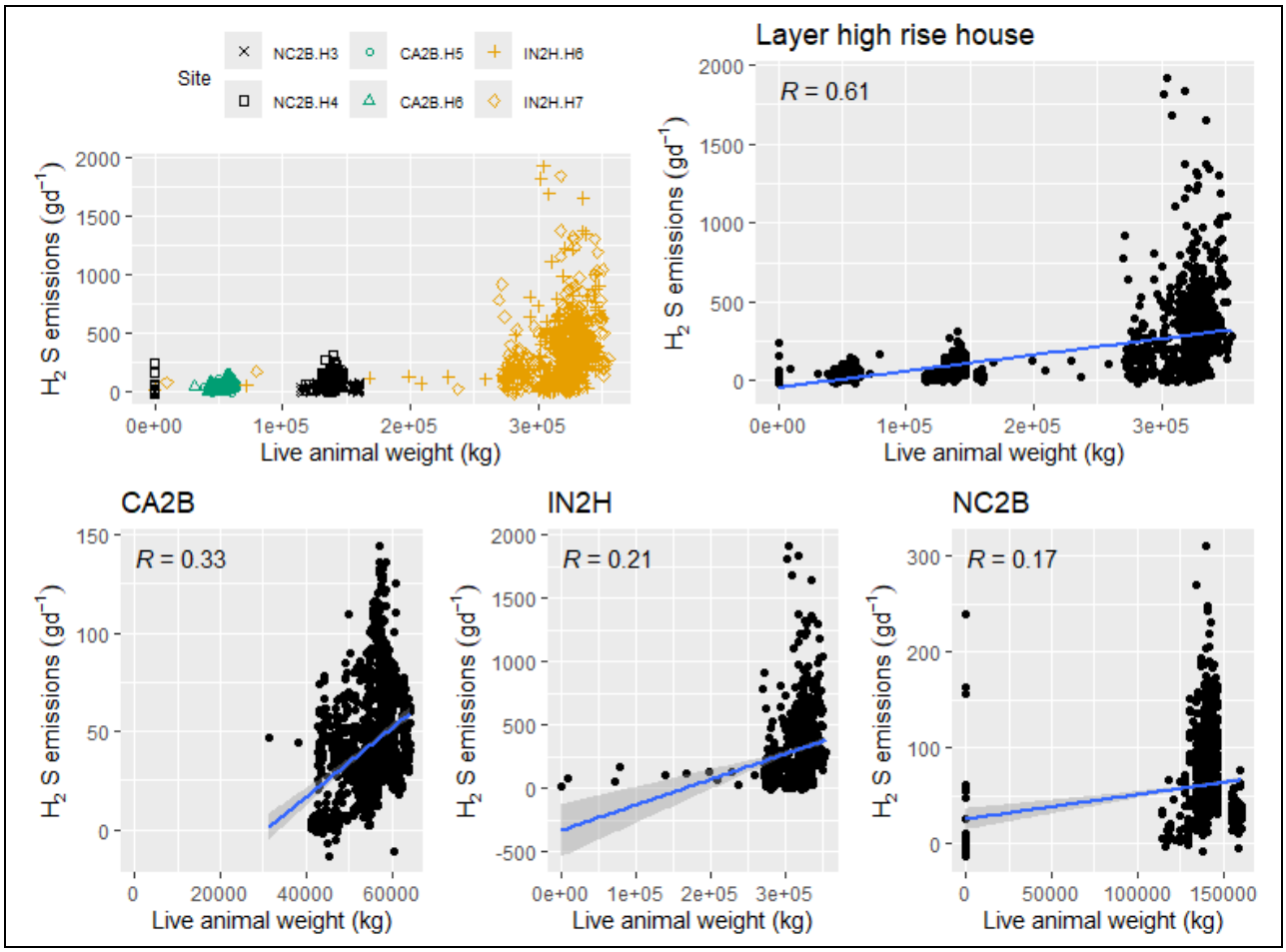

Figure 1.17: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus live animal weight.

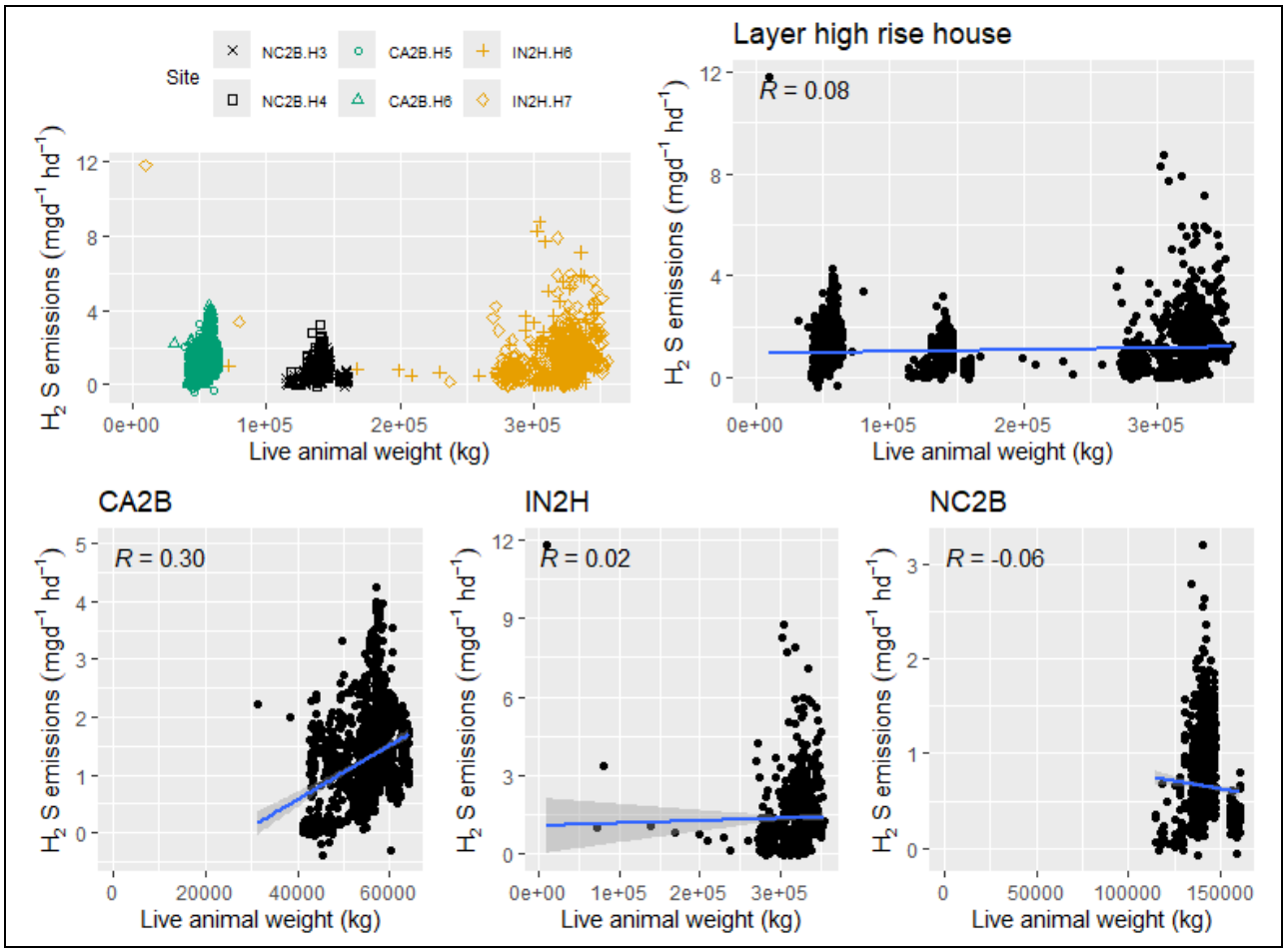

Figure 1.18: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

1.1.2.4 Exhaust temperature

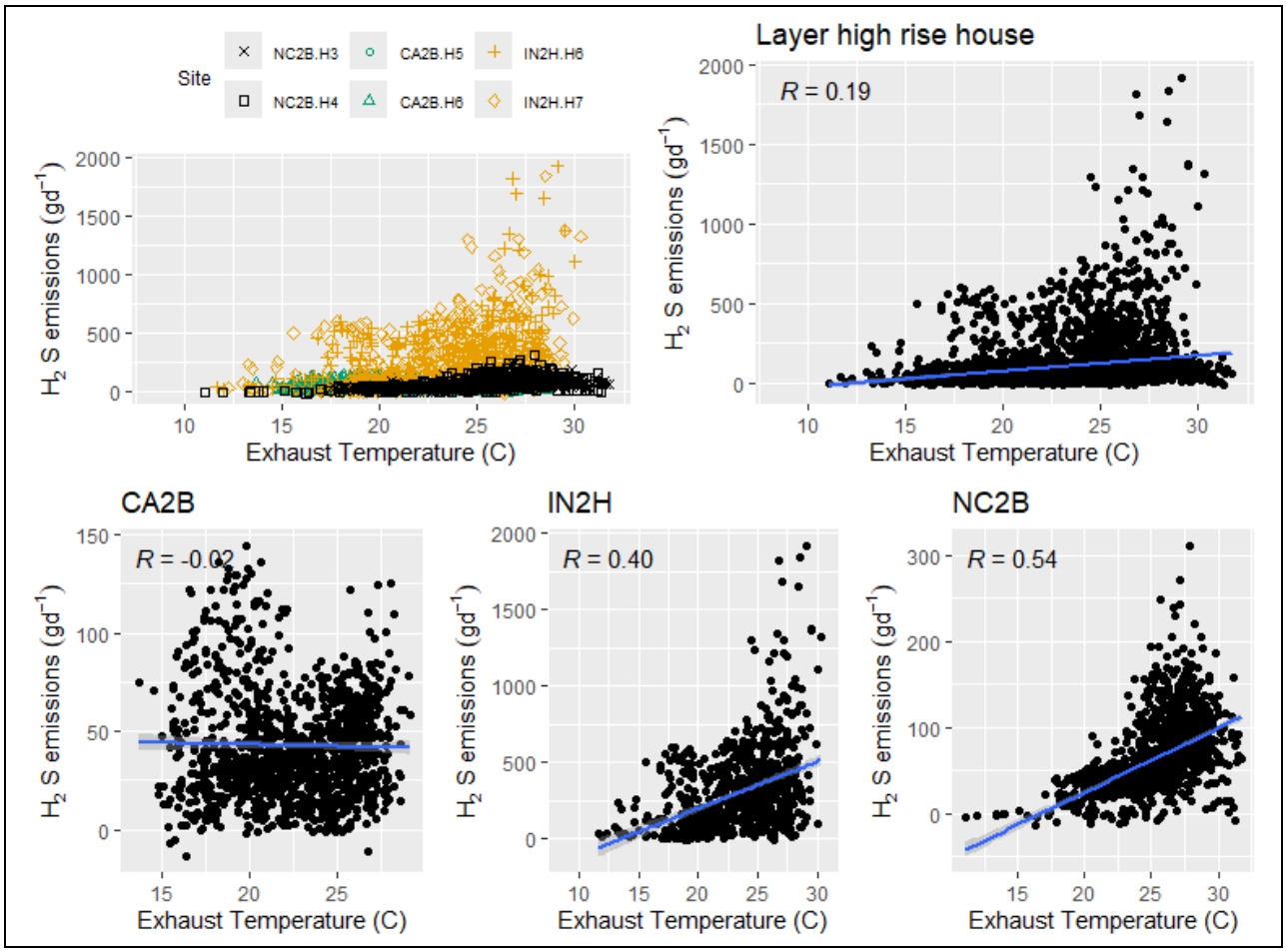

Figure 1.19: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus exhaust temperature.

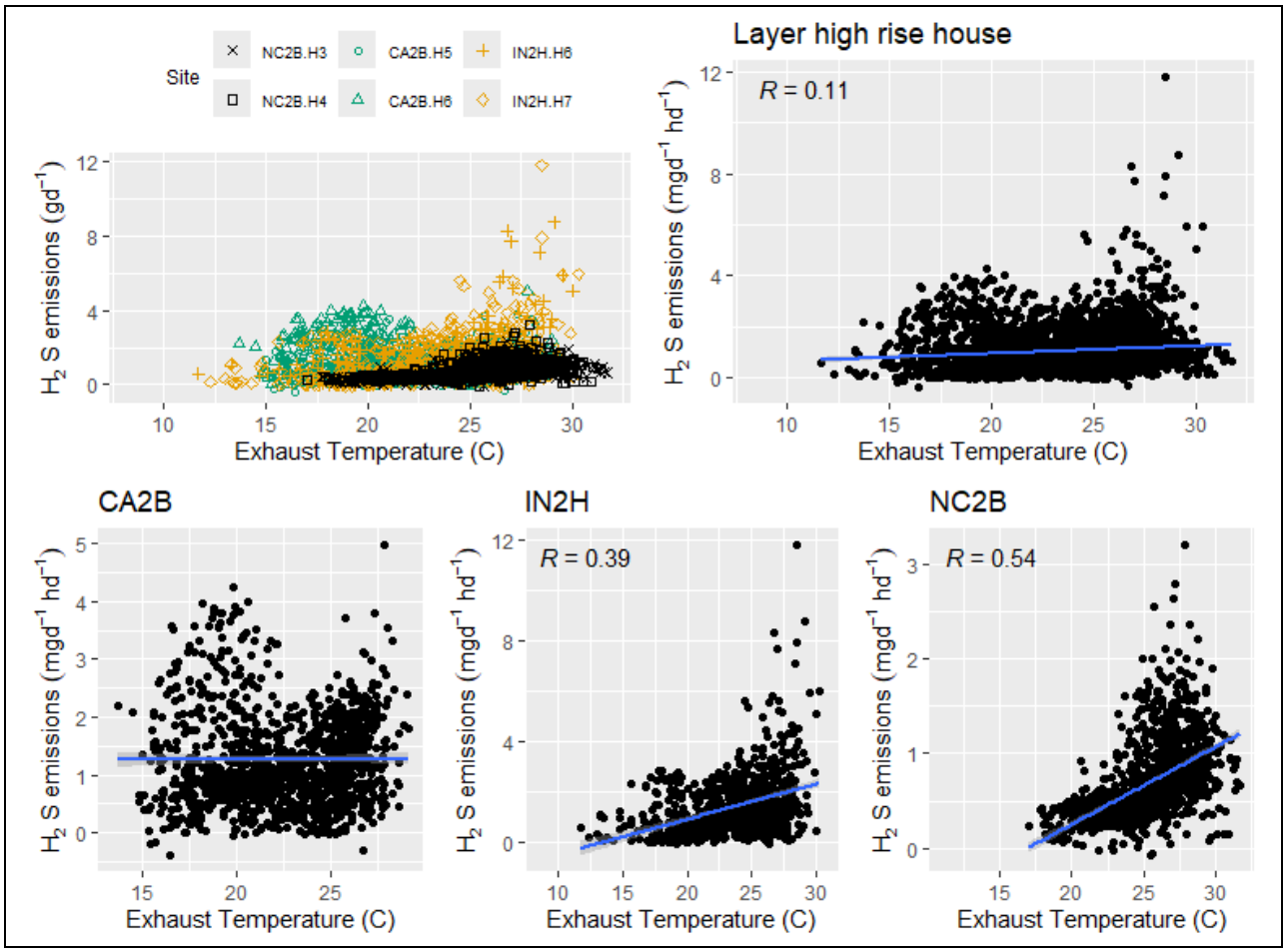

Figure 1.20: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

1.1.2.5 Exhaust relative humidity

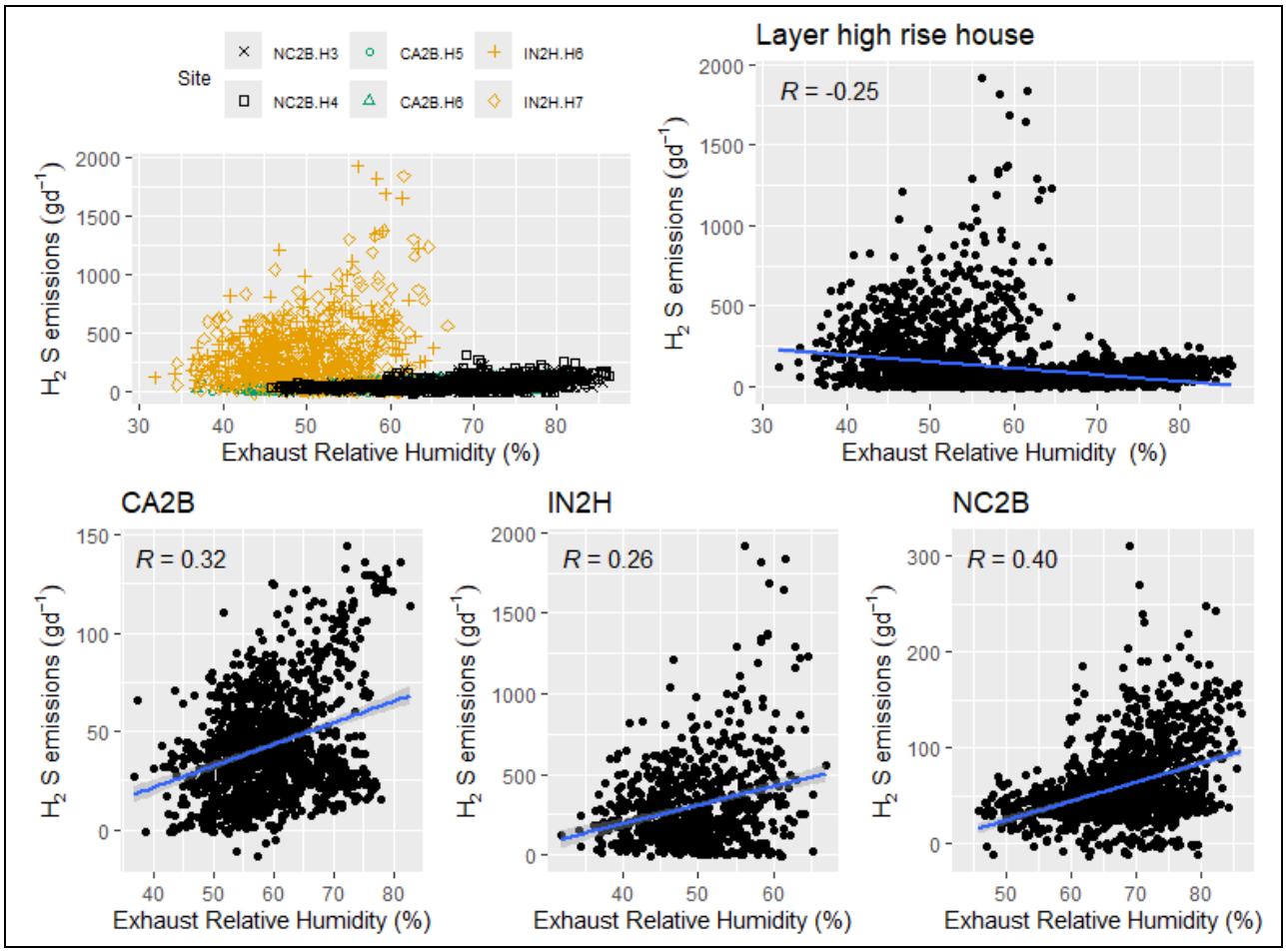

Figure 1.21: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus exhaust relative humidity.

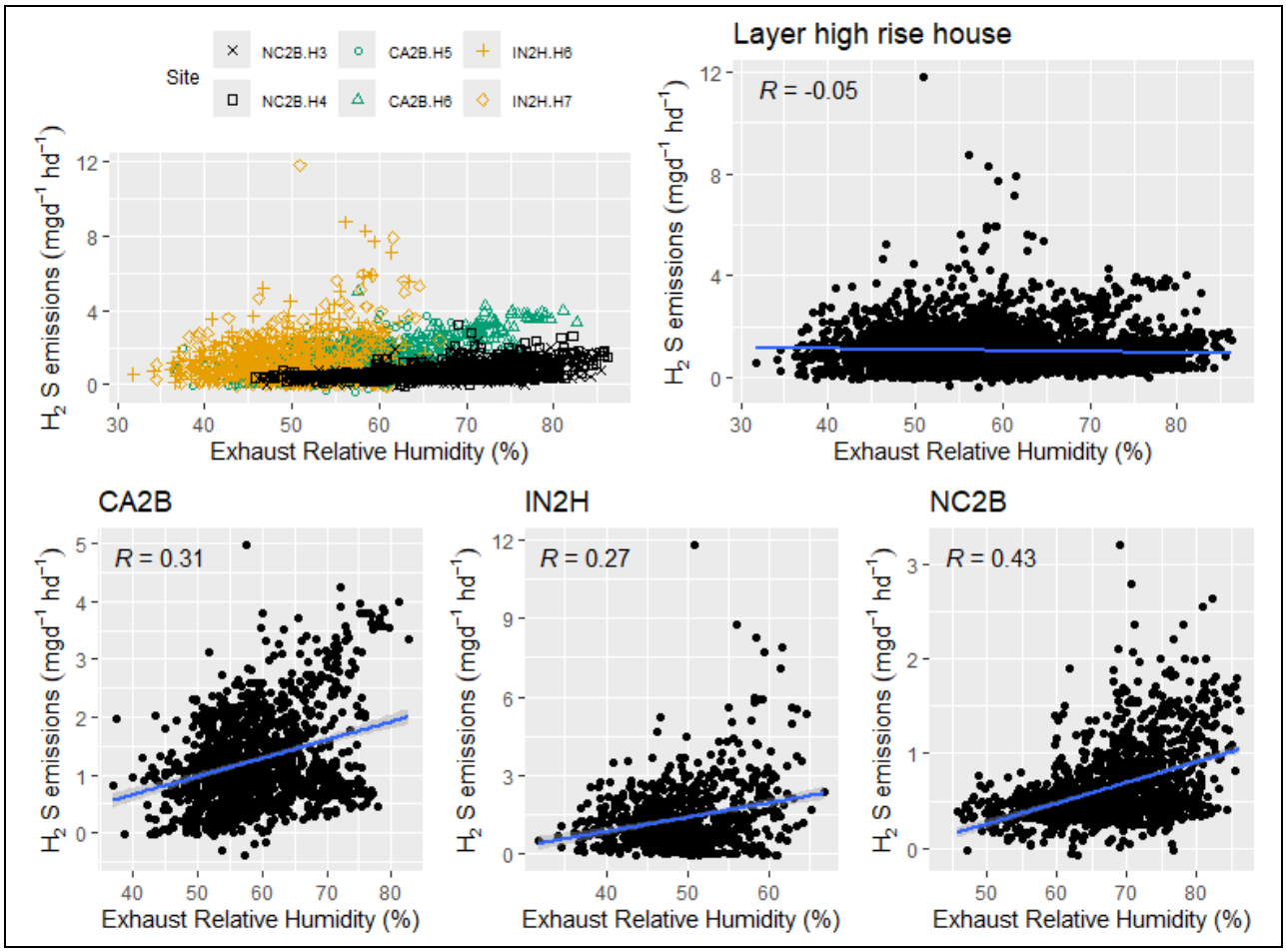

Figure 1.22: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

1.1.2.6 Airflow

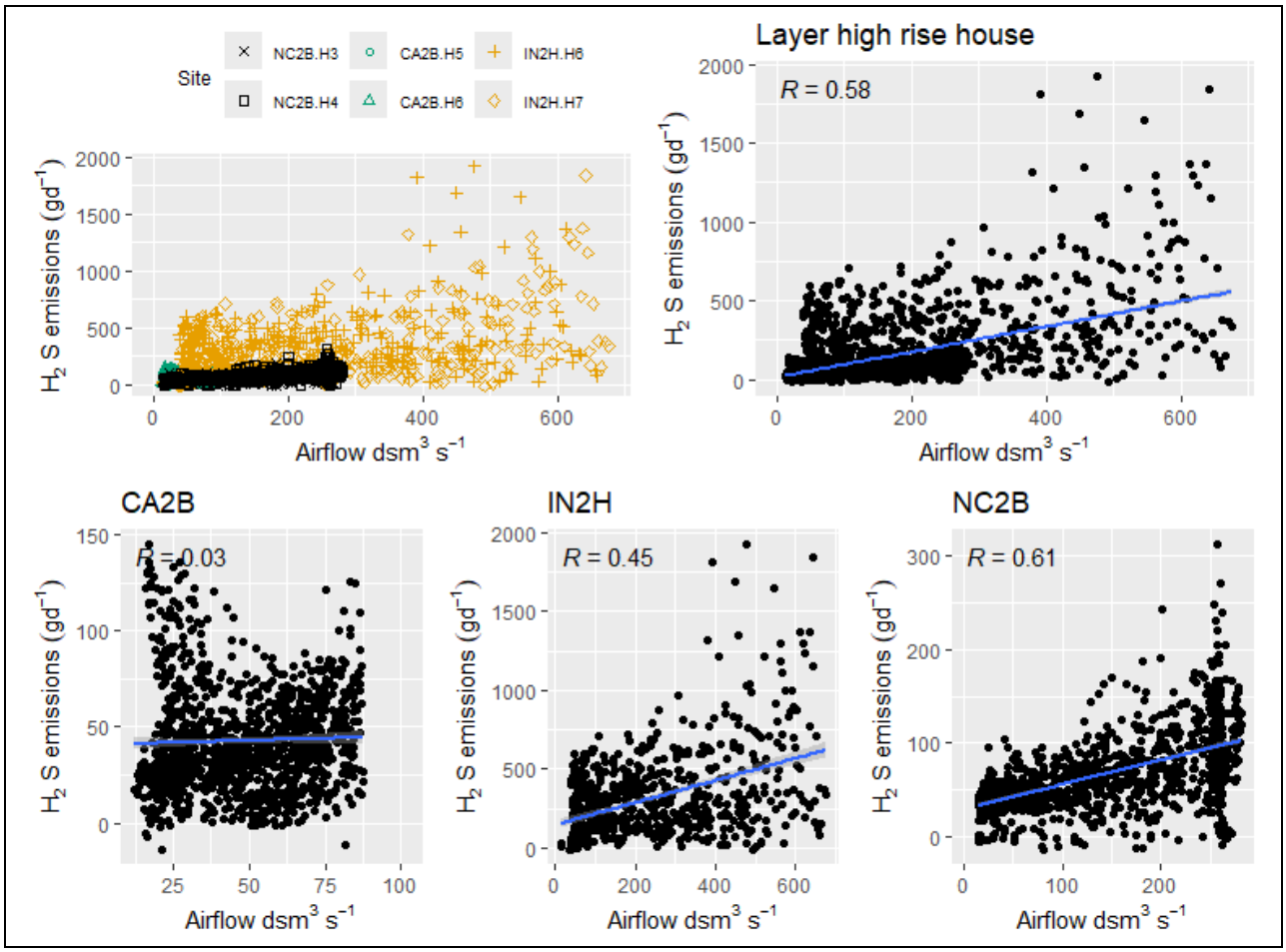

Figure 1.23: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus airflow.

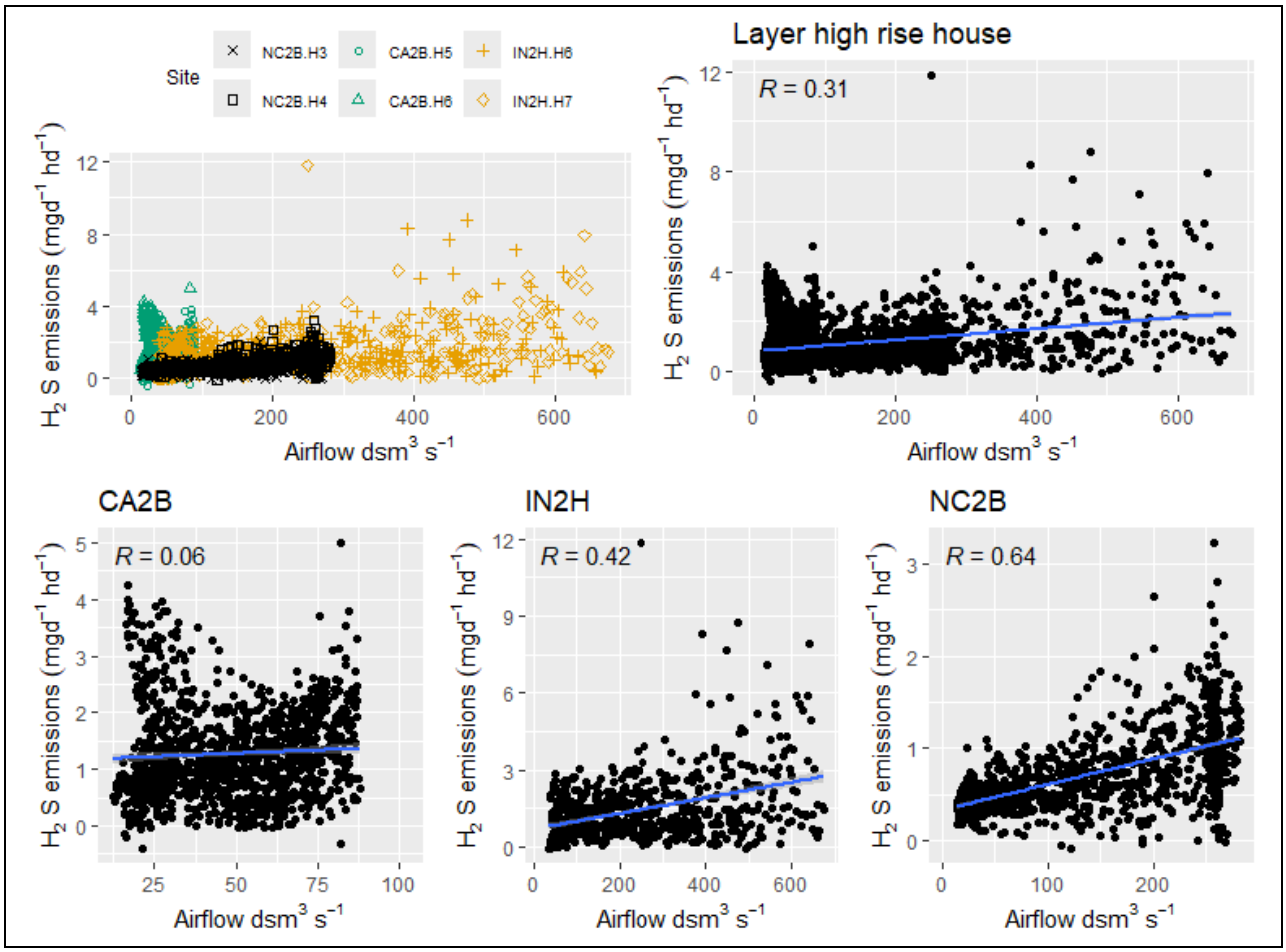

Figure 1.24: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus airflow.

1.1.3 Particulate Matter (PM_{10})

1.1.3.1 Inventory

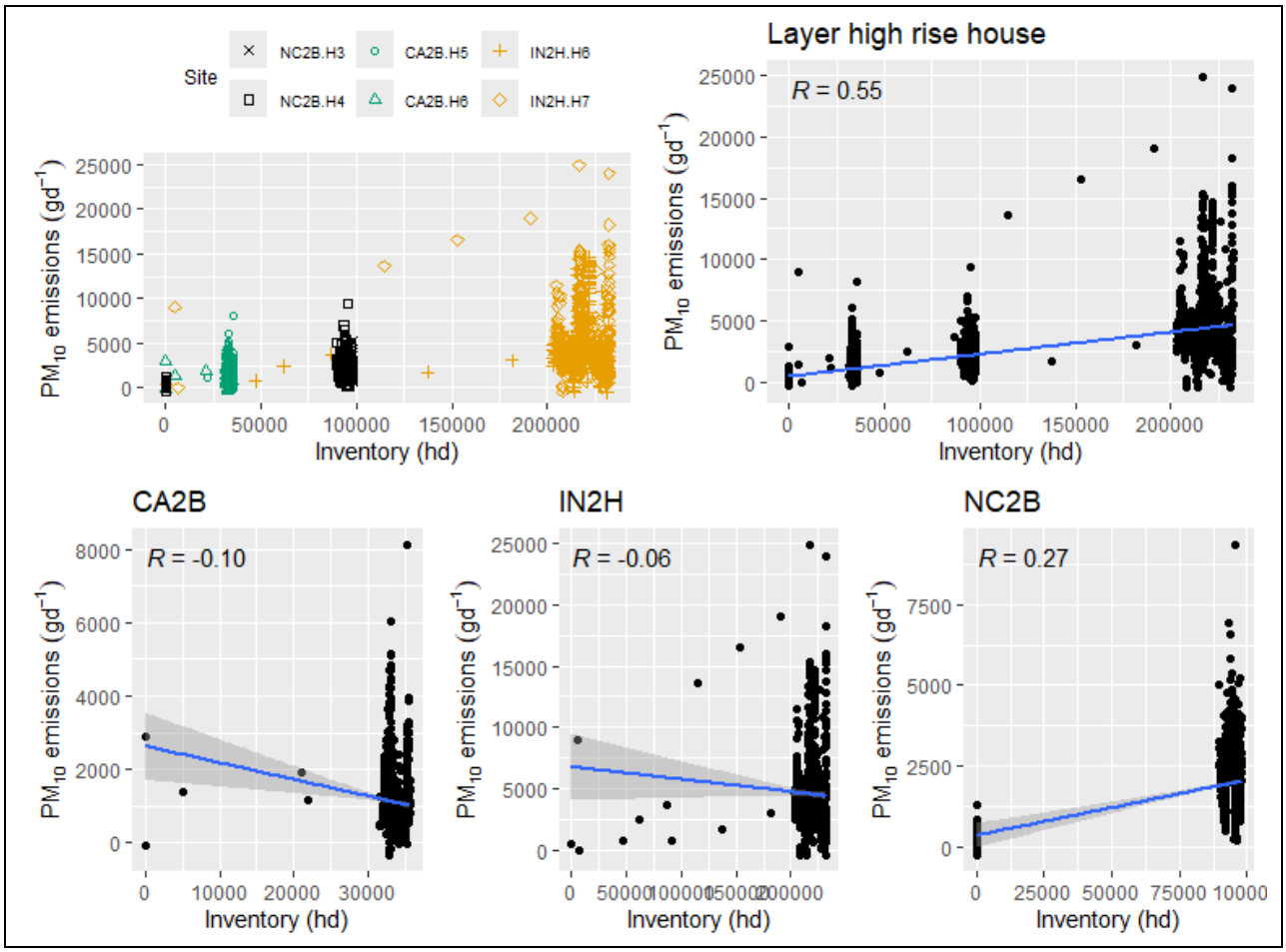

Figure 1.25: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus Inventory.

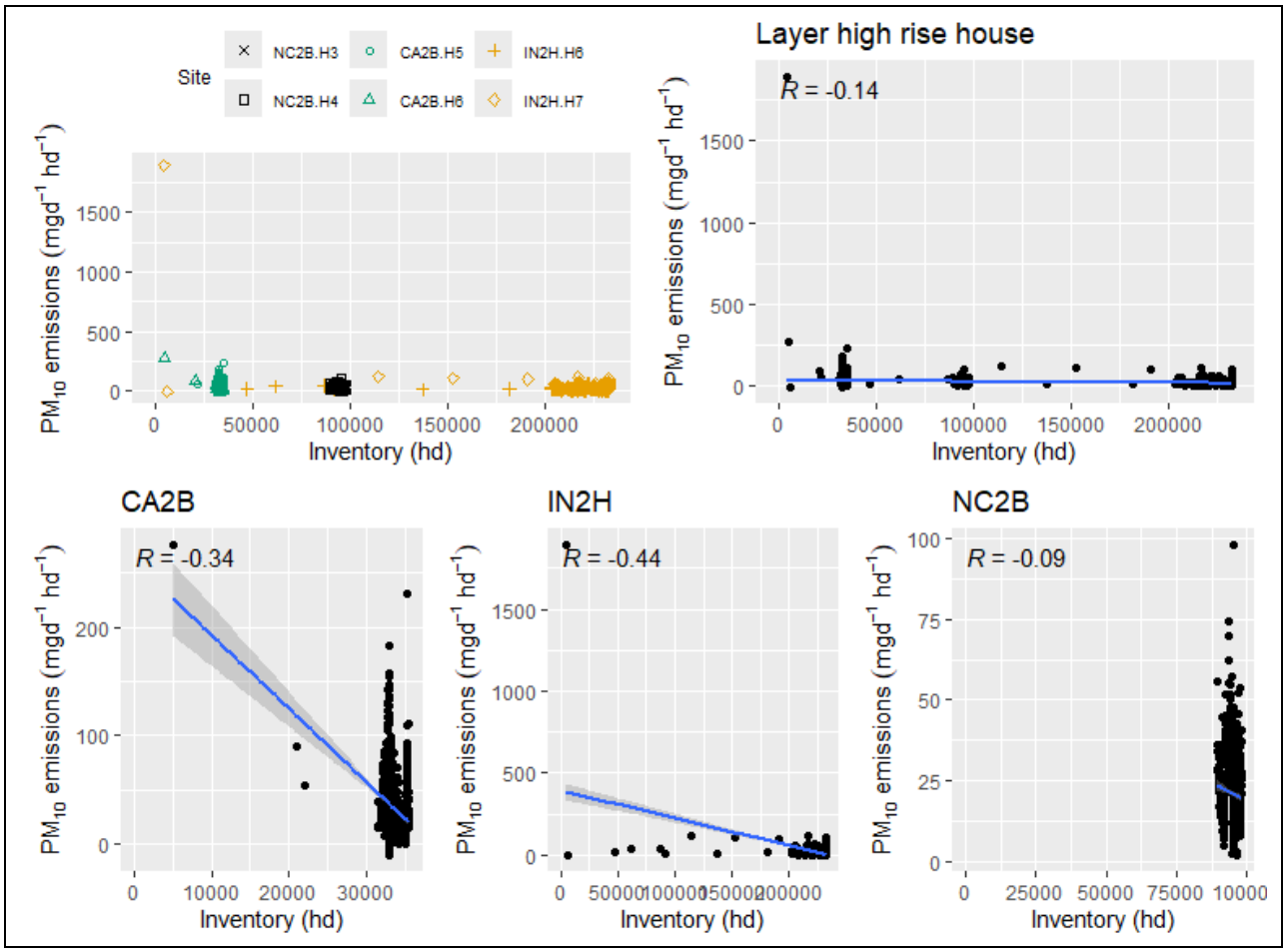

Figure 1.26: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

1.1.3.2 Average animal weight

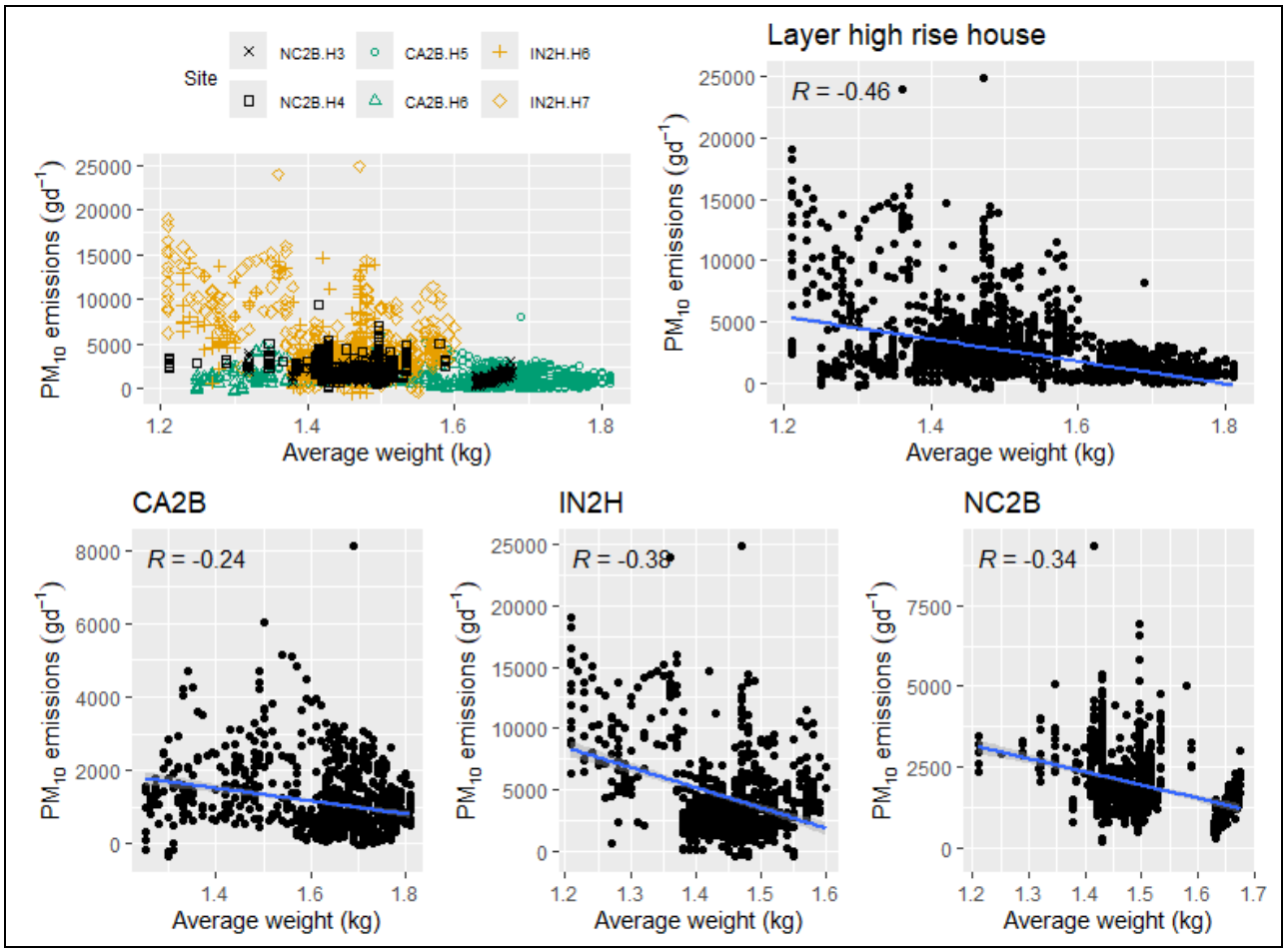

Figure 1.27: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus average animal weight.

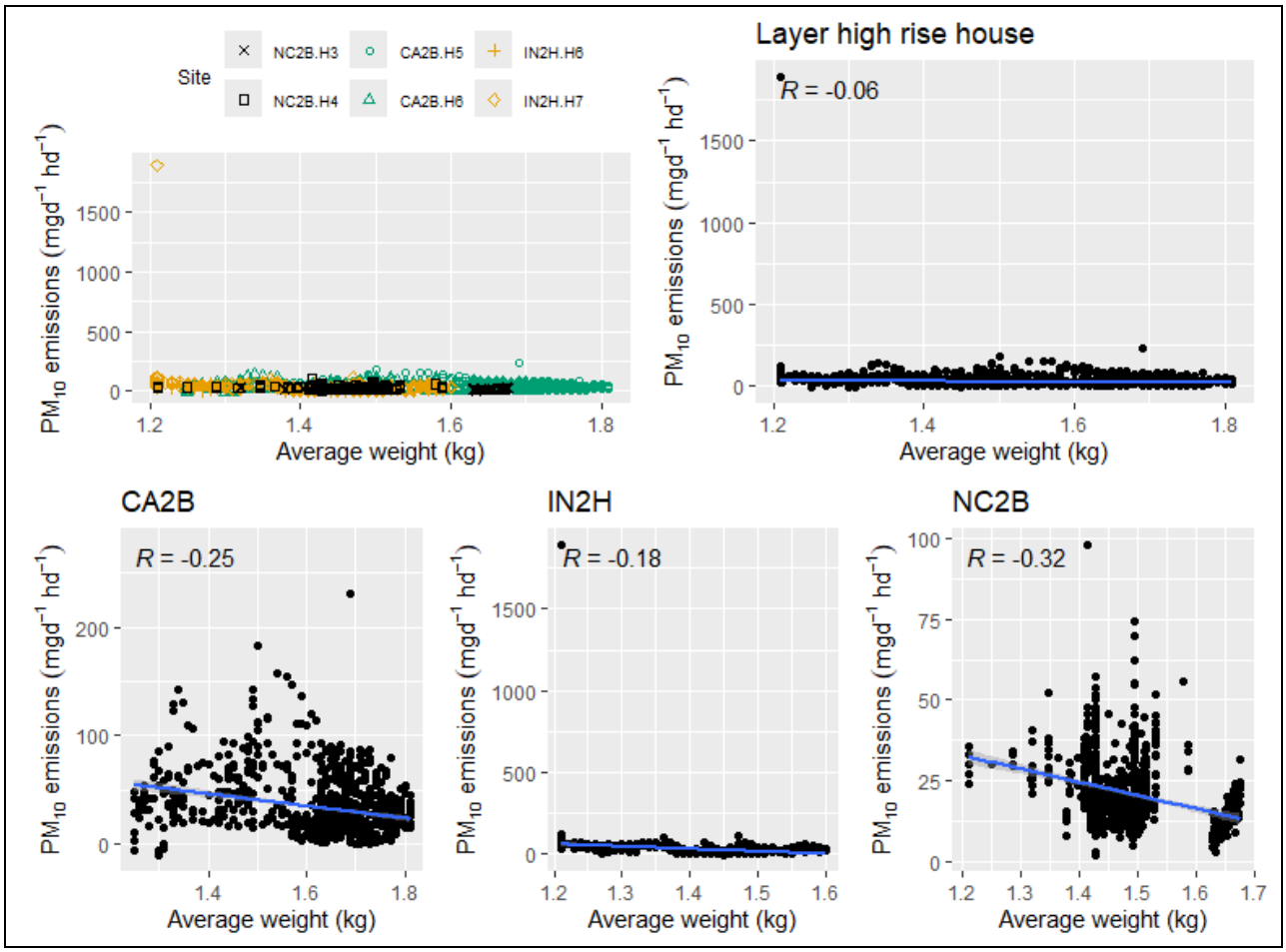

Figure 1.28: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

1.1.3.3 Live animal weight

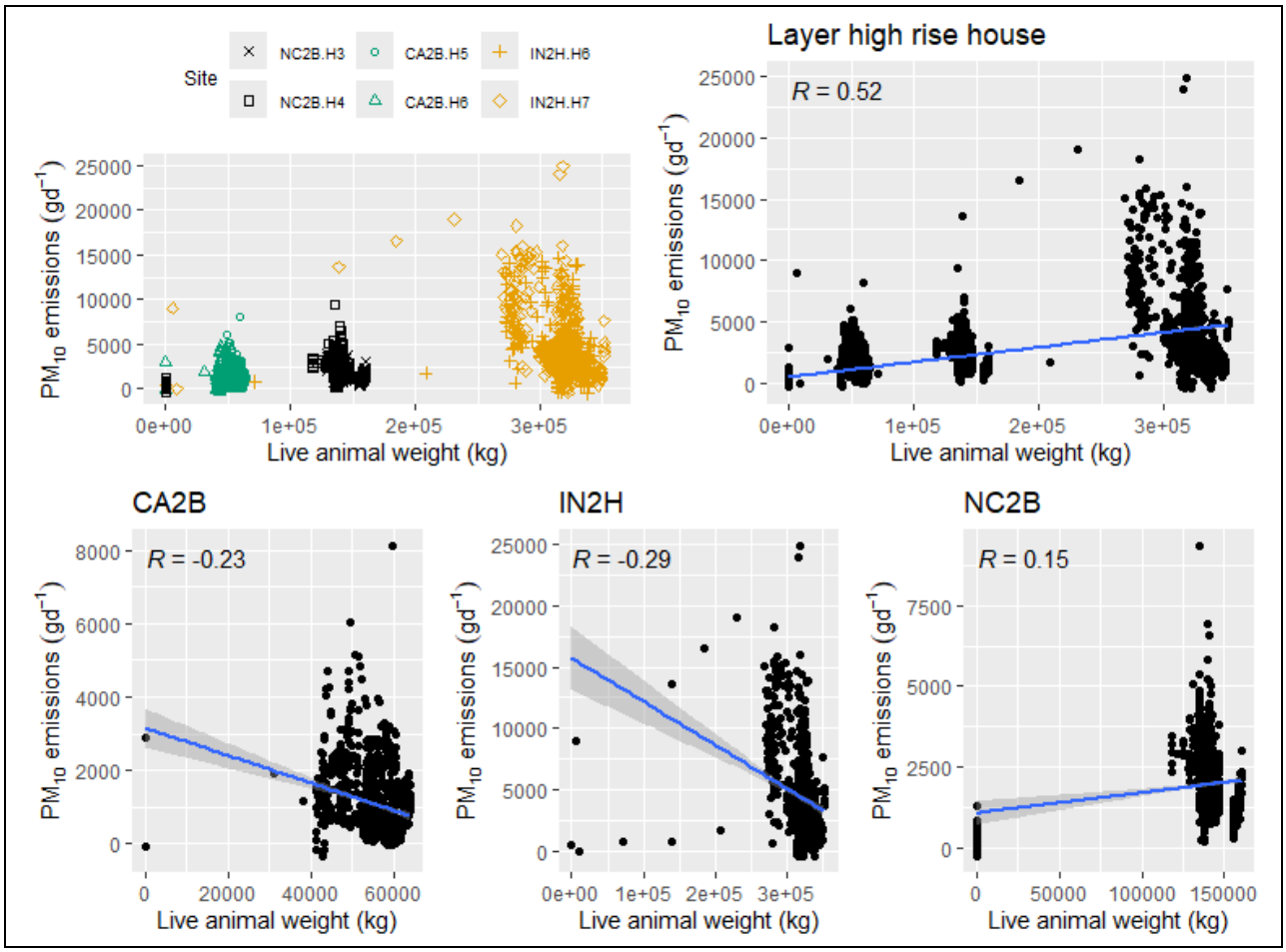

Figure 1.29: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus live animal weight.

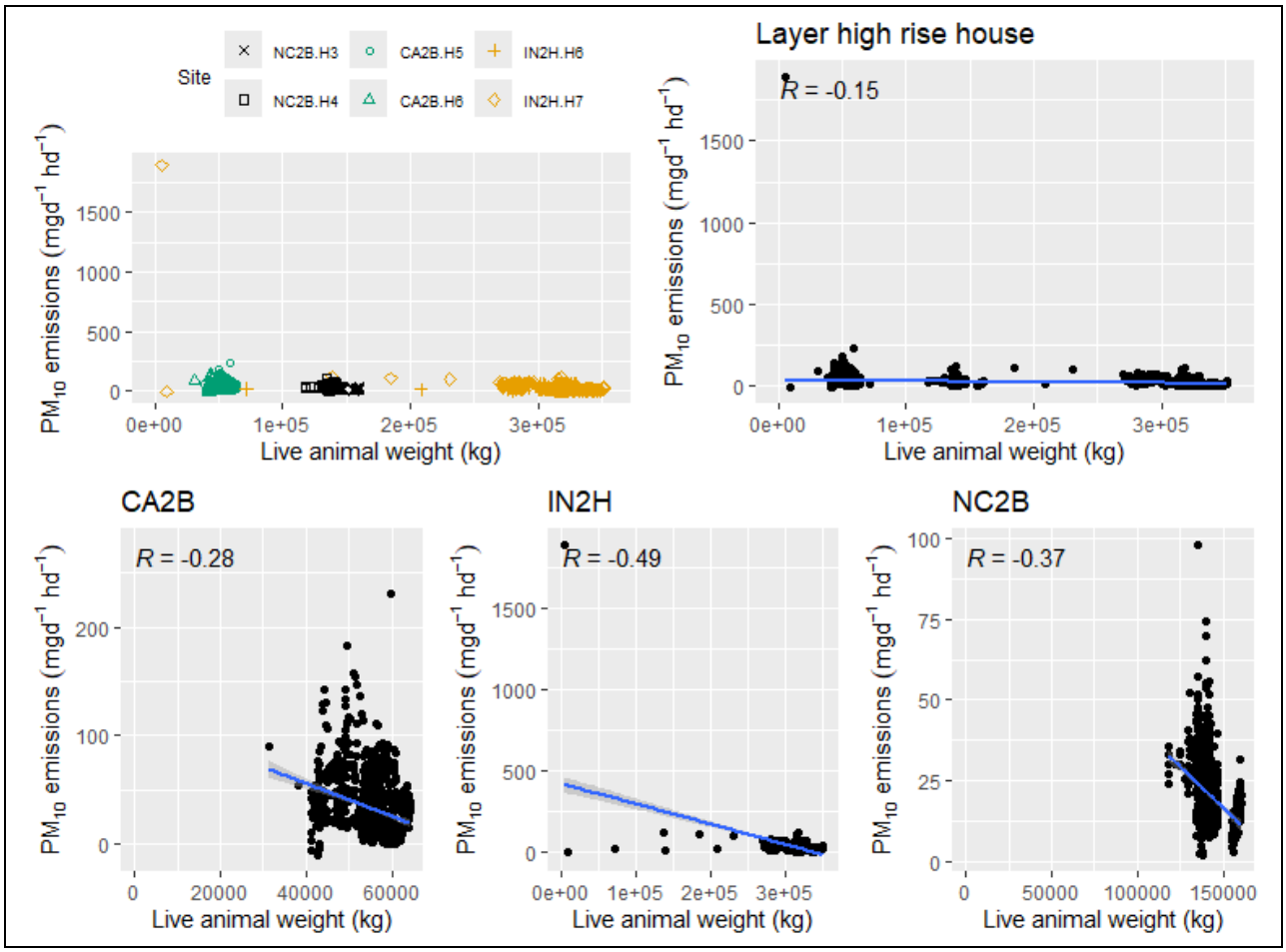

Figure 1.30: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

1.1.3.4 Exhaust temperature

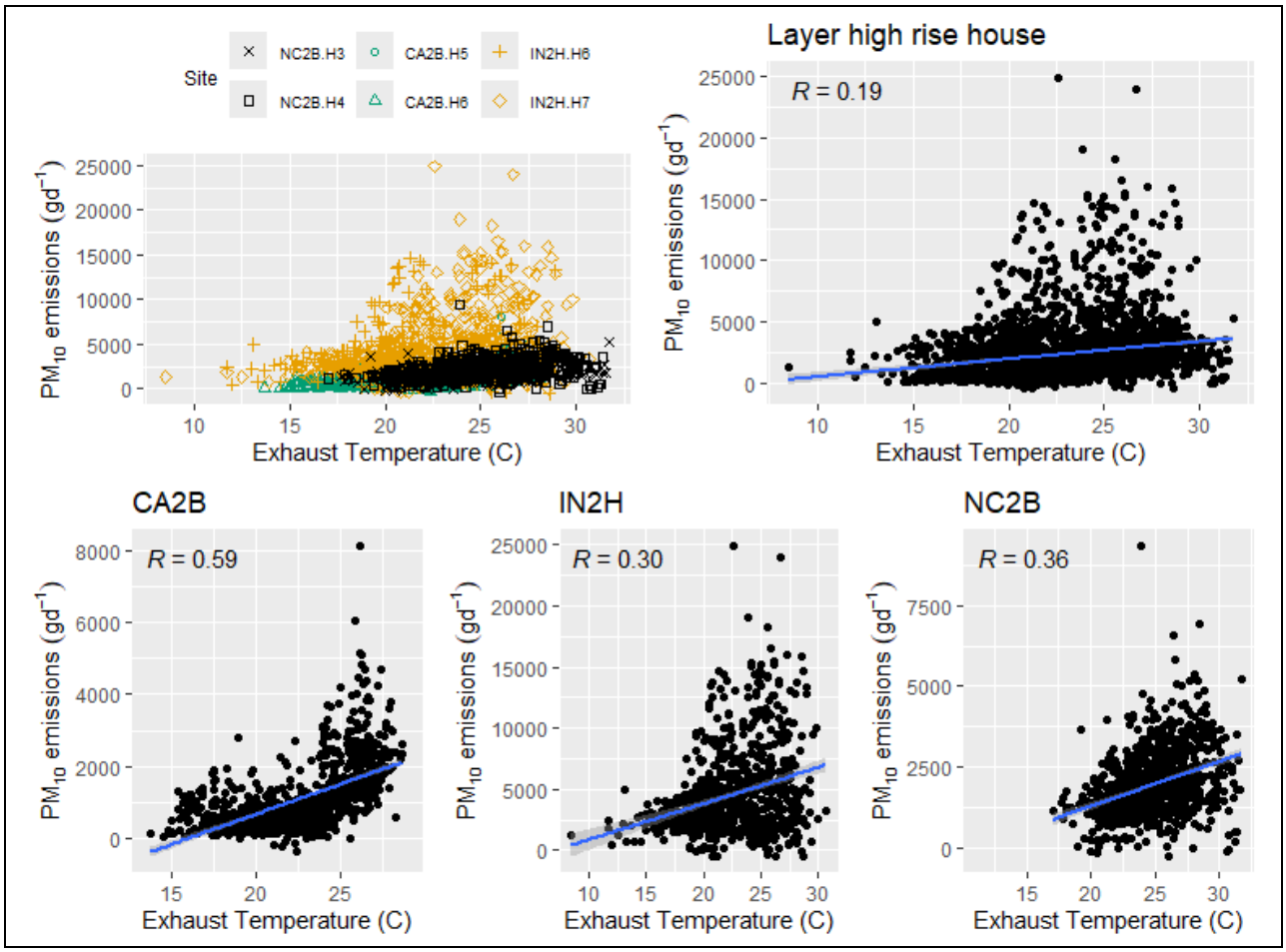

Figure 1.31: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus exhaust temperature.

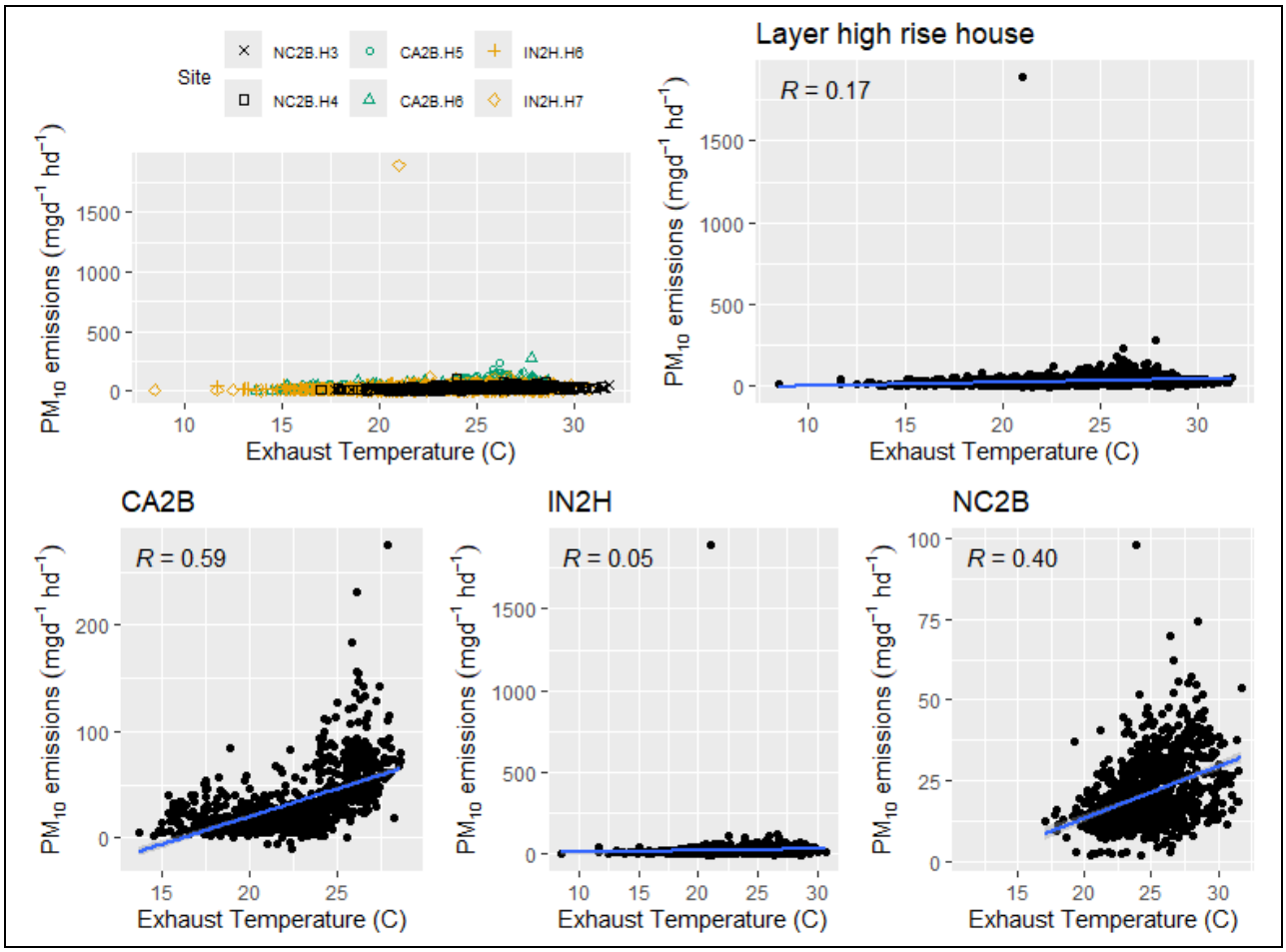

Figure 1.32: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

1.1.3.5 Exhaust relative humidity

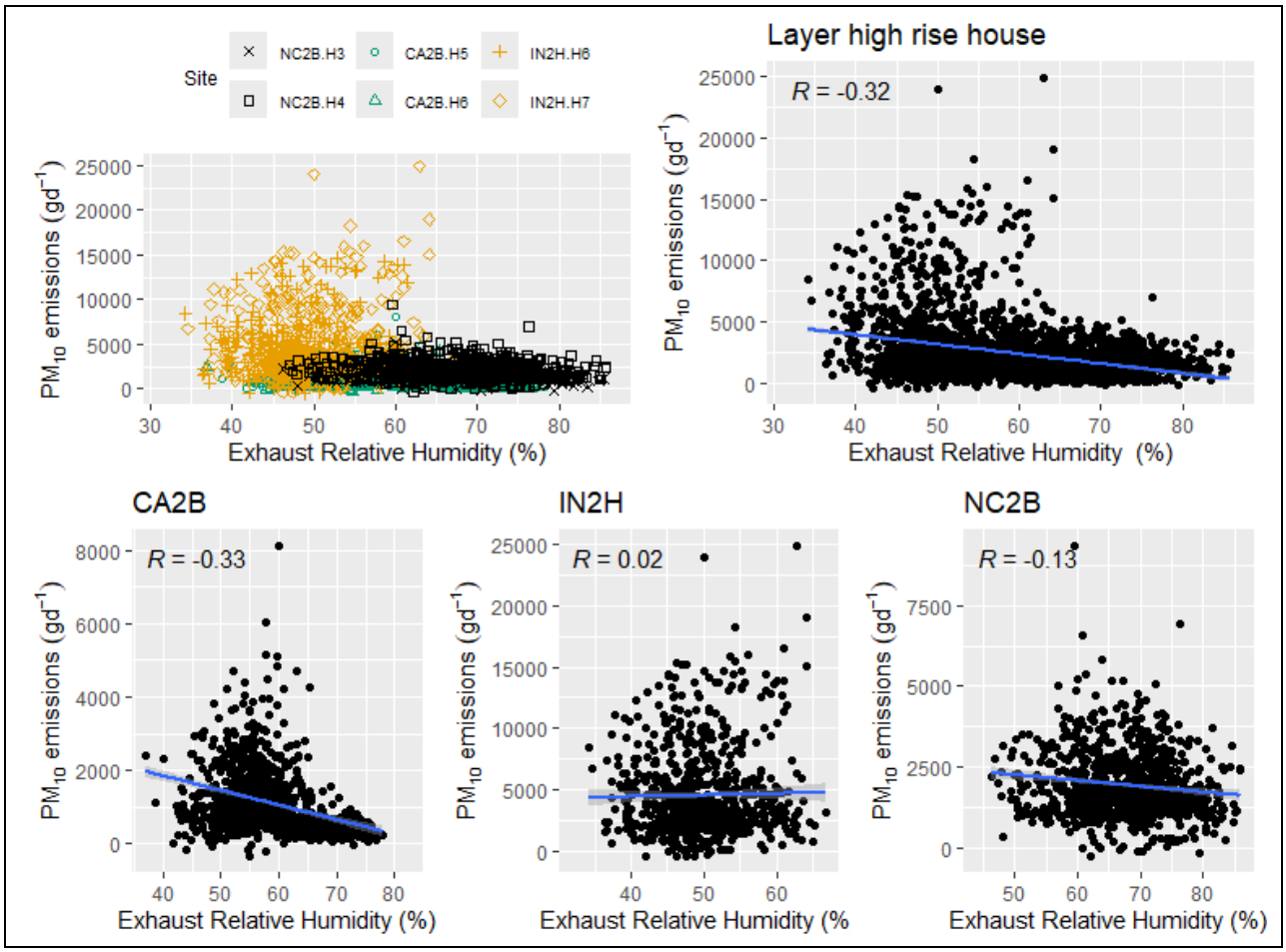

Figure 1.33: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus exhaust relative humidity.

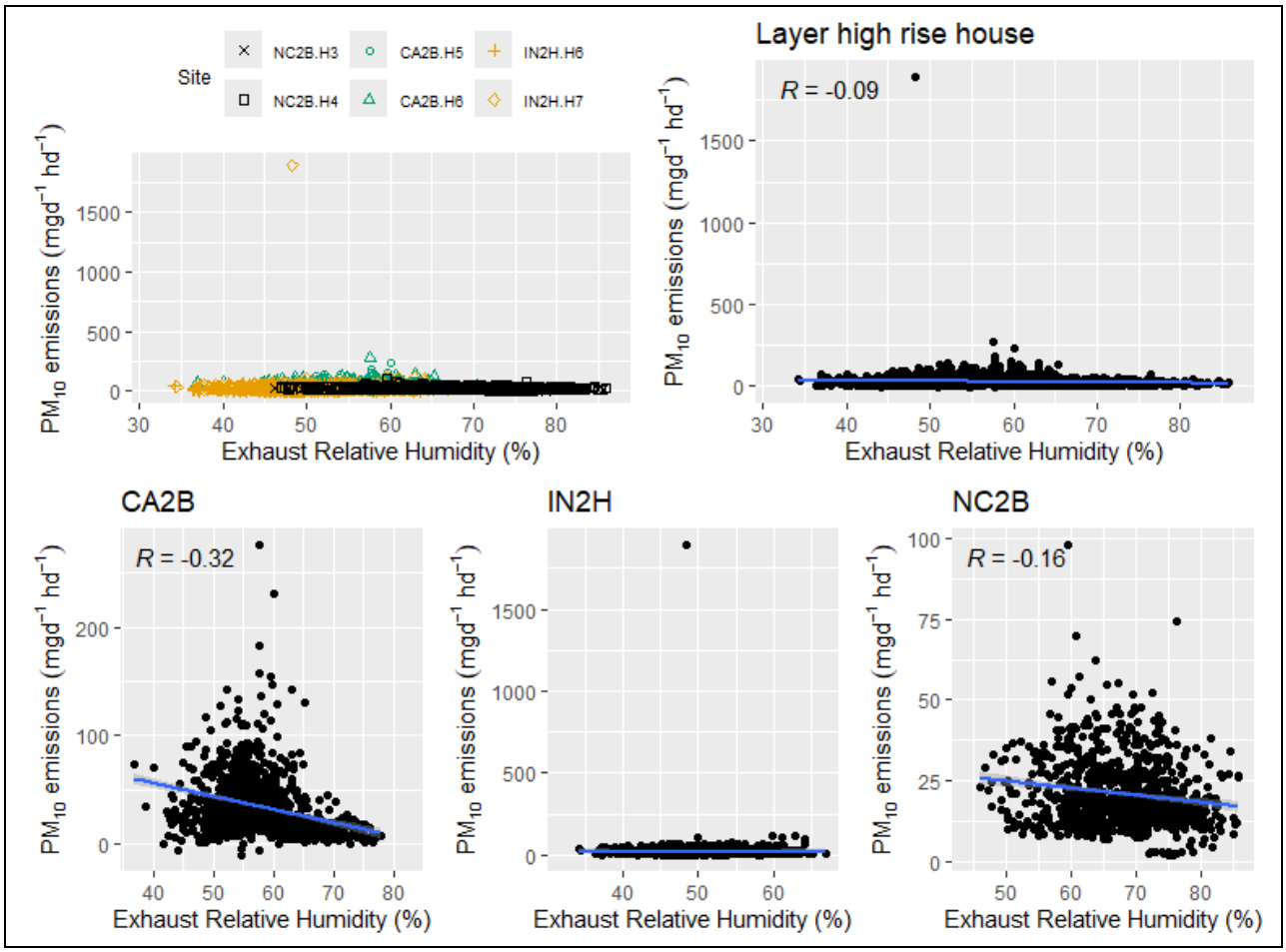

Figure 1.34: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

1.1.3.6 Airflow

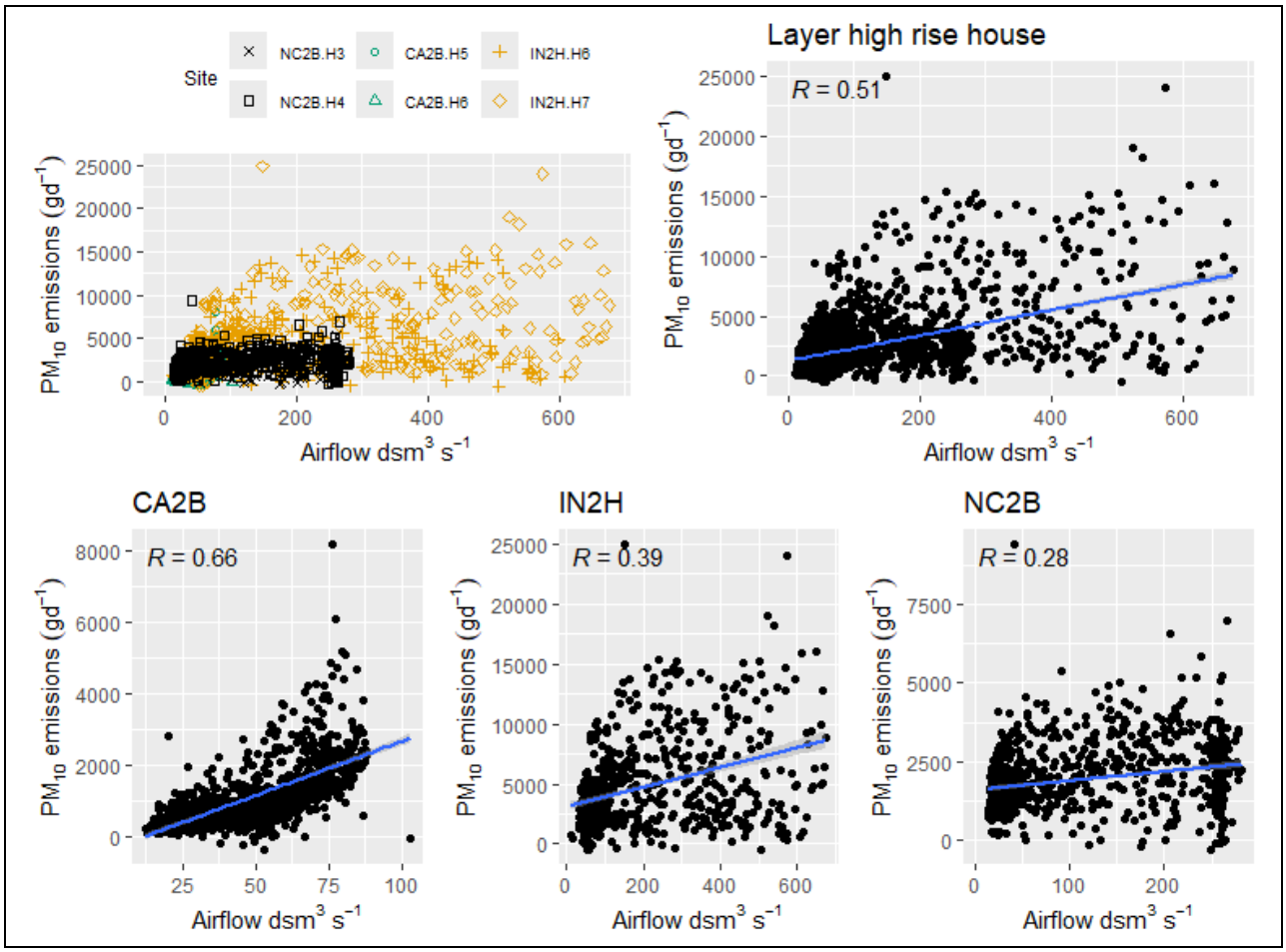

Figure 1.35: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus airflow.

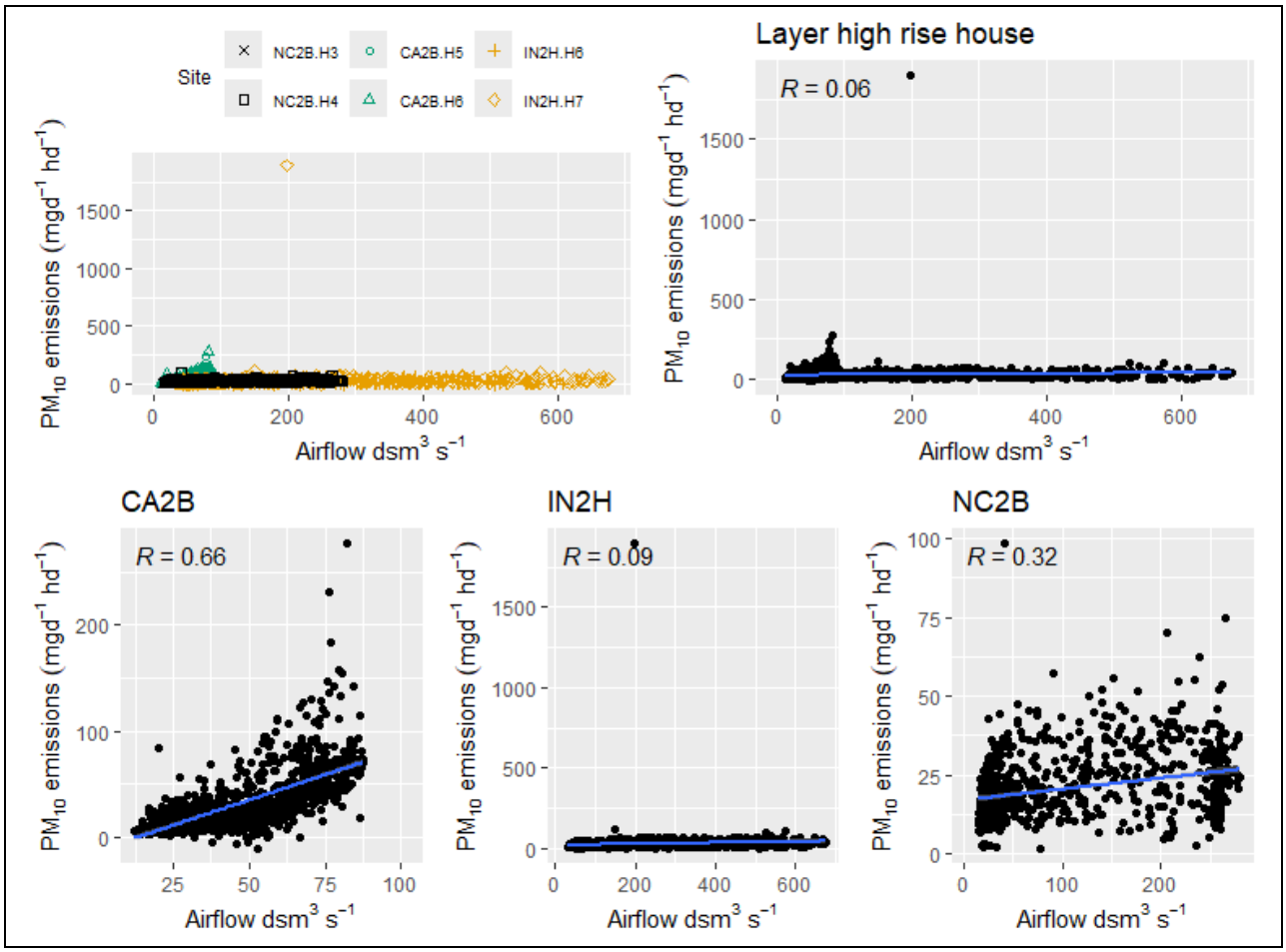

Figure 1.36: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus airflow.

1.1.4 Particulate Matter ($PM_{2.5}$)

1.1.4.1 Inventory

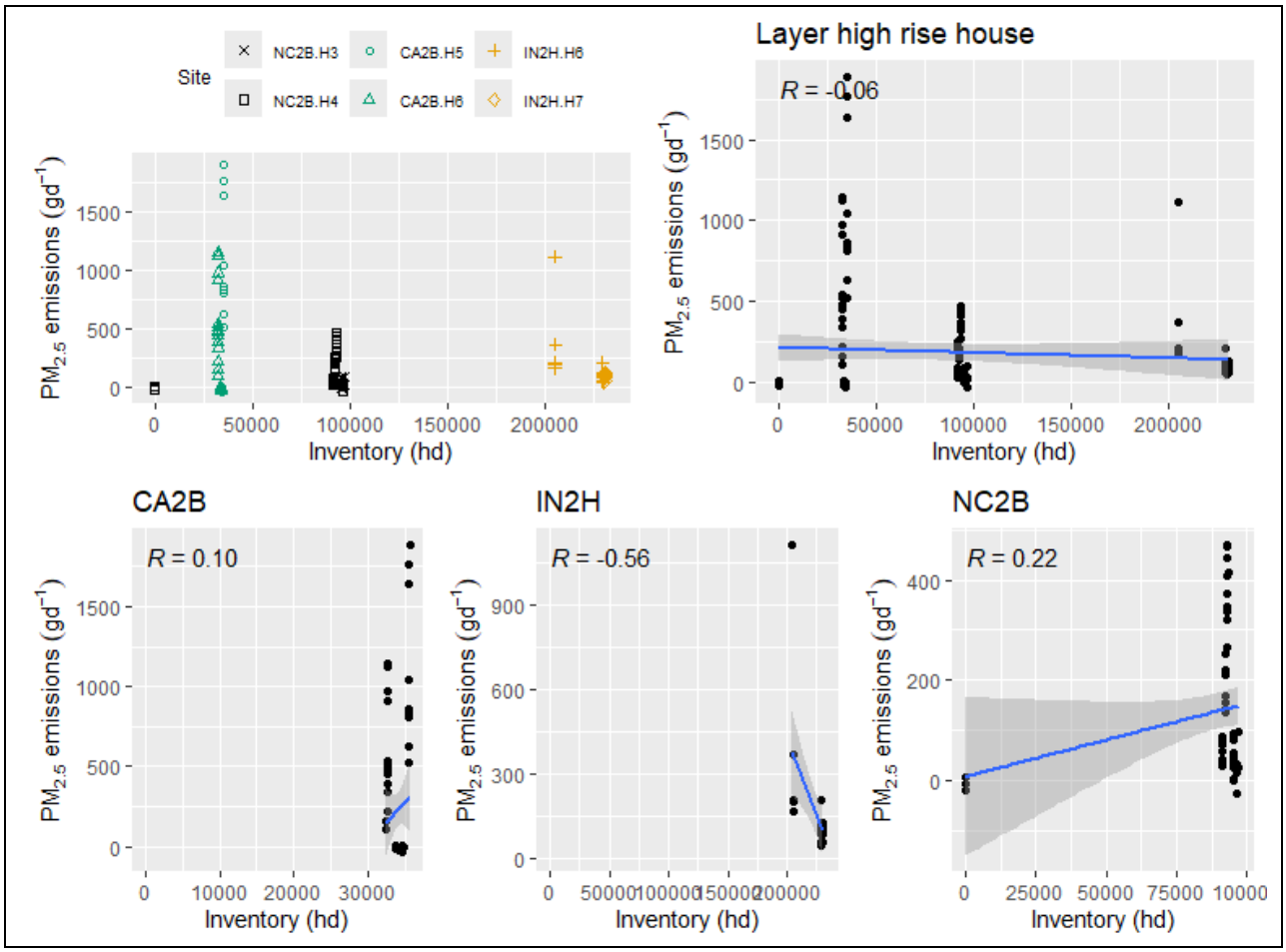

Figure 1.37: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus Inventory.

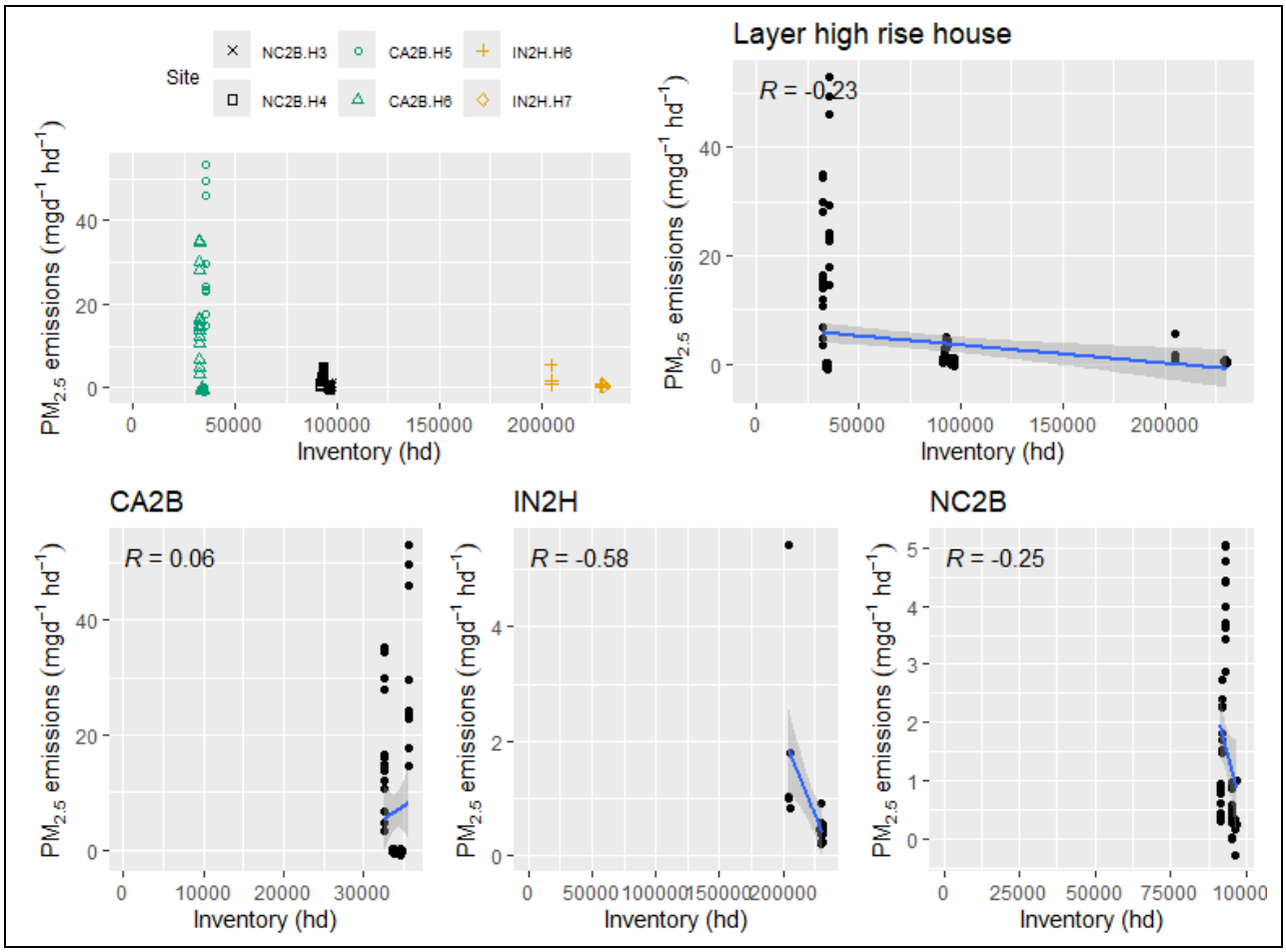

Figure 1.38: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

1.1.4.2 Average animal weight

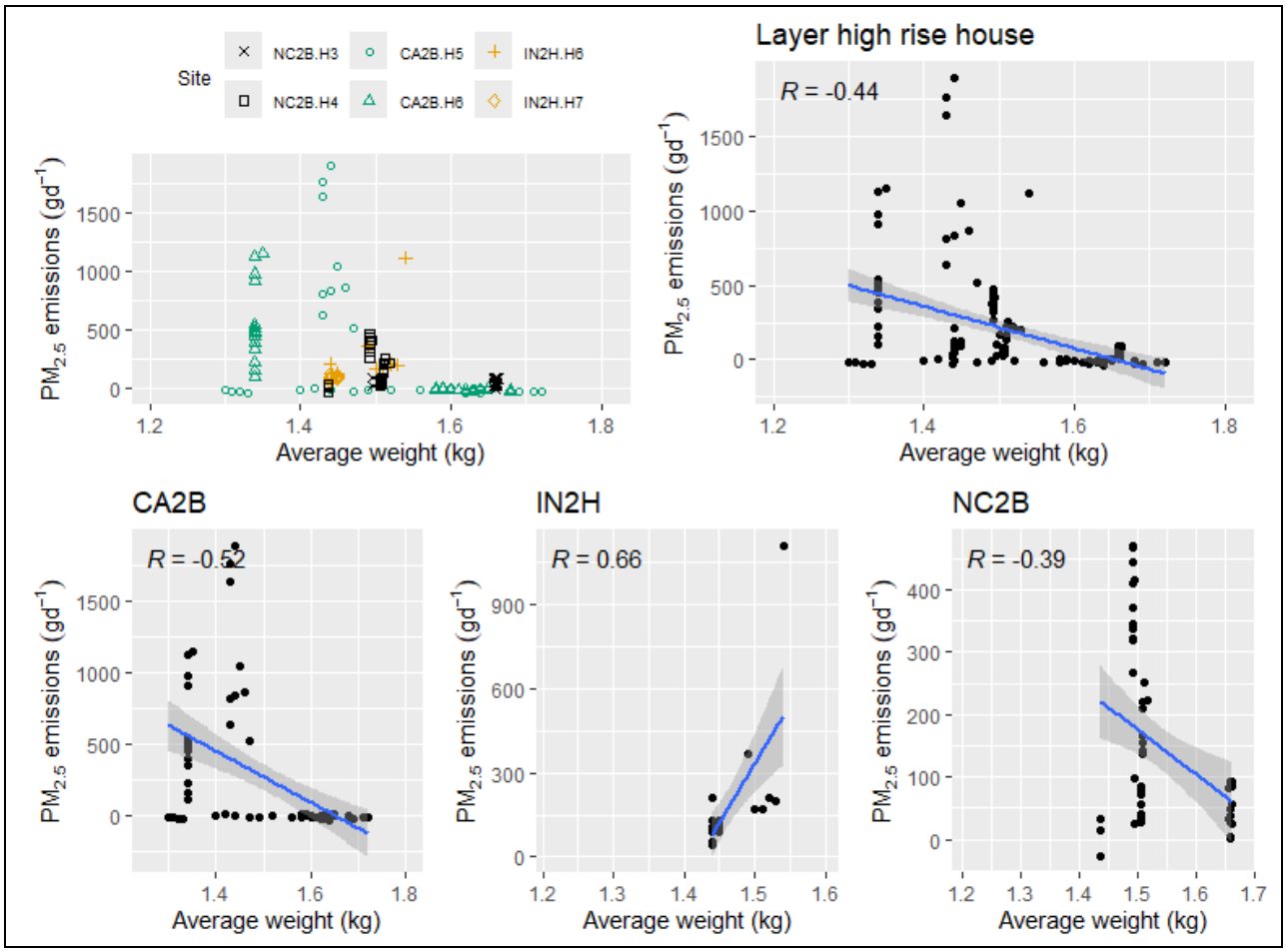

Figure 1.39: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus average animal weight.

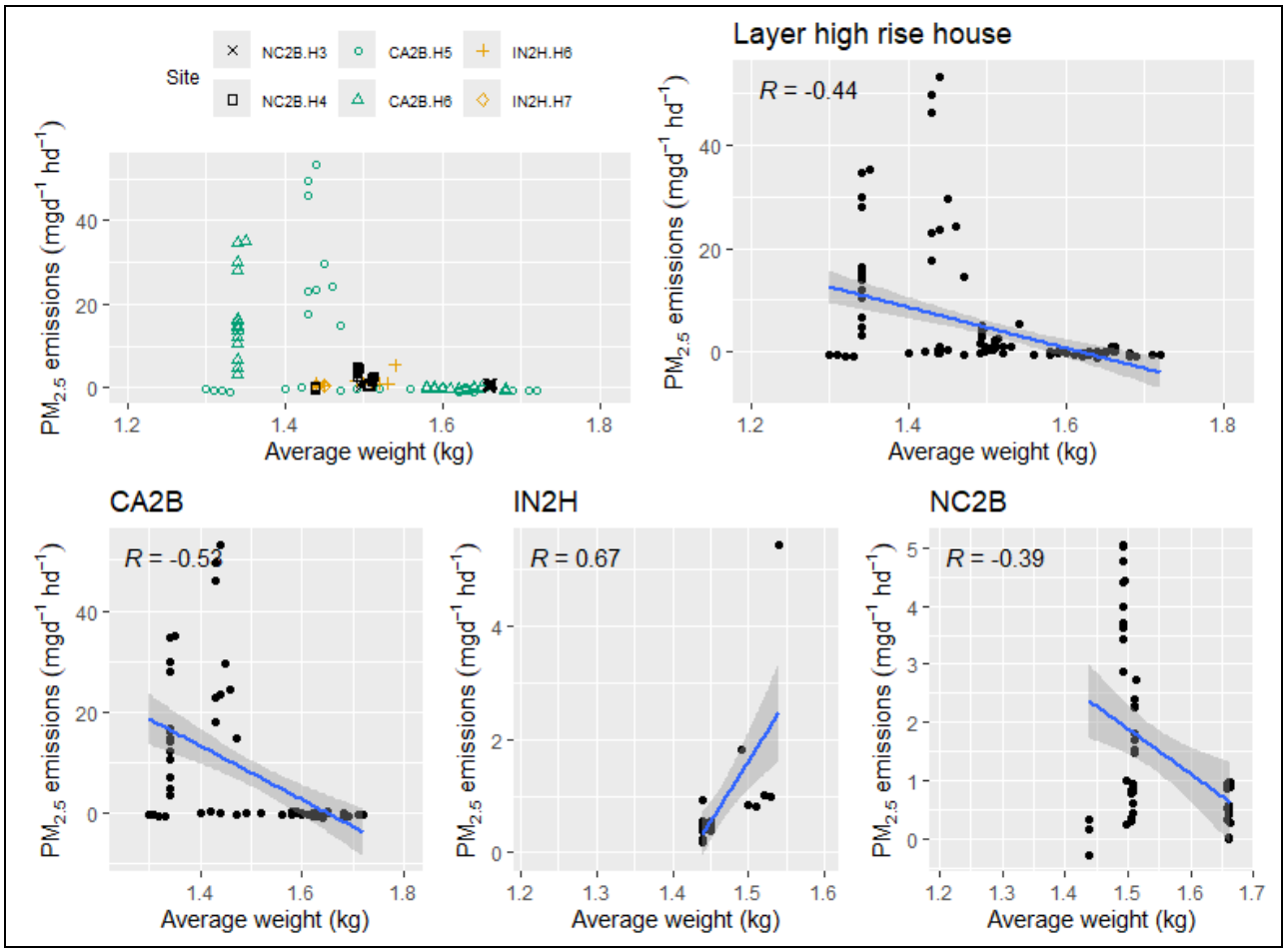

Figure 1.40: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

1.1.4.3 Live animal weight

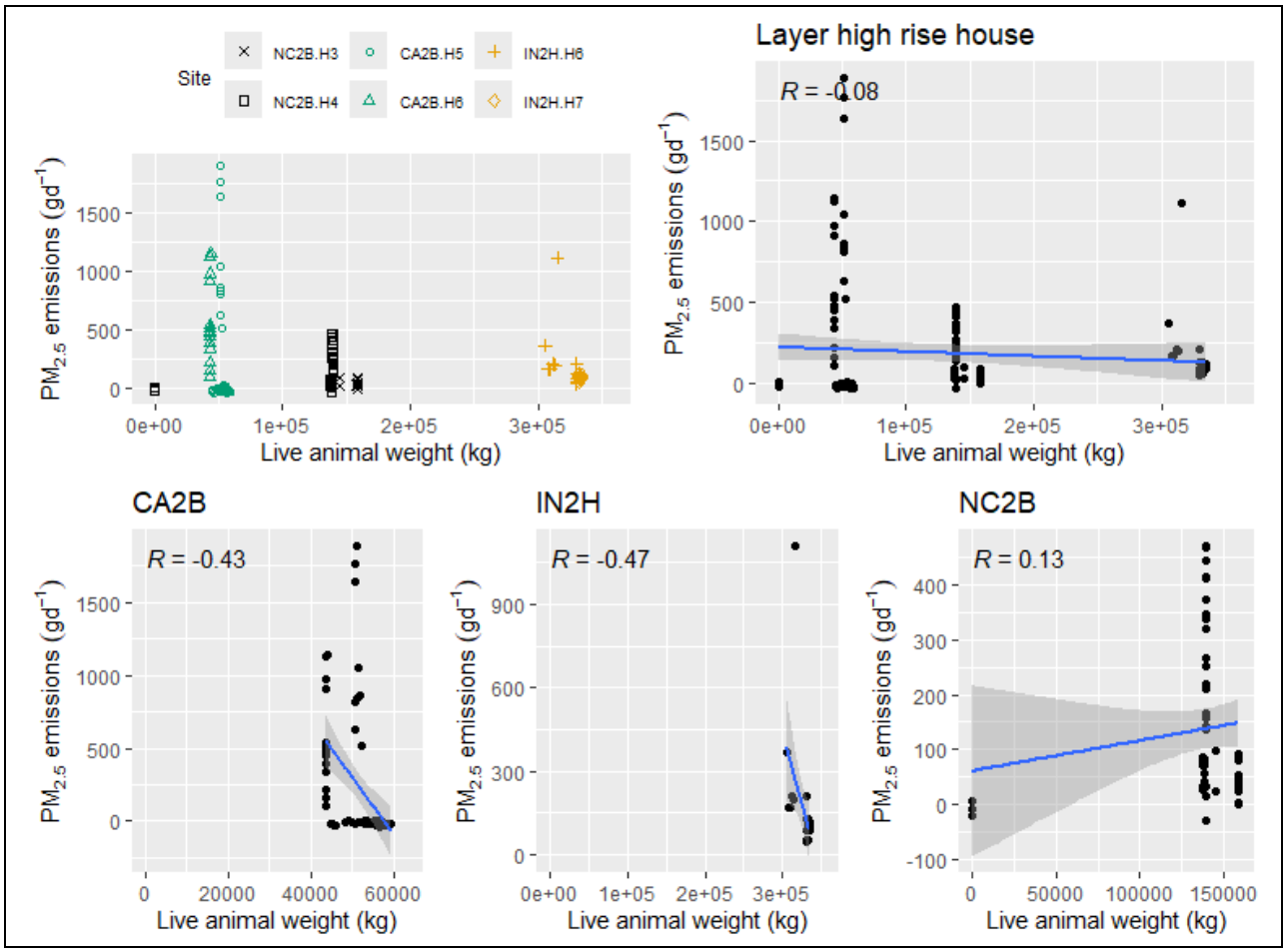

Figure 1.41: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus live animal weight.

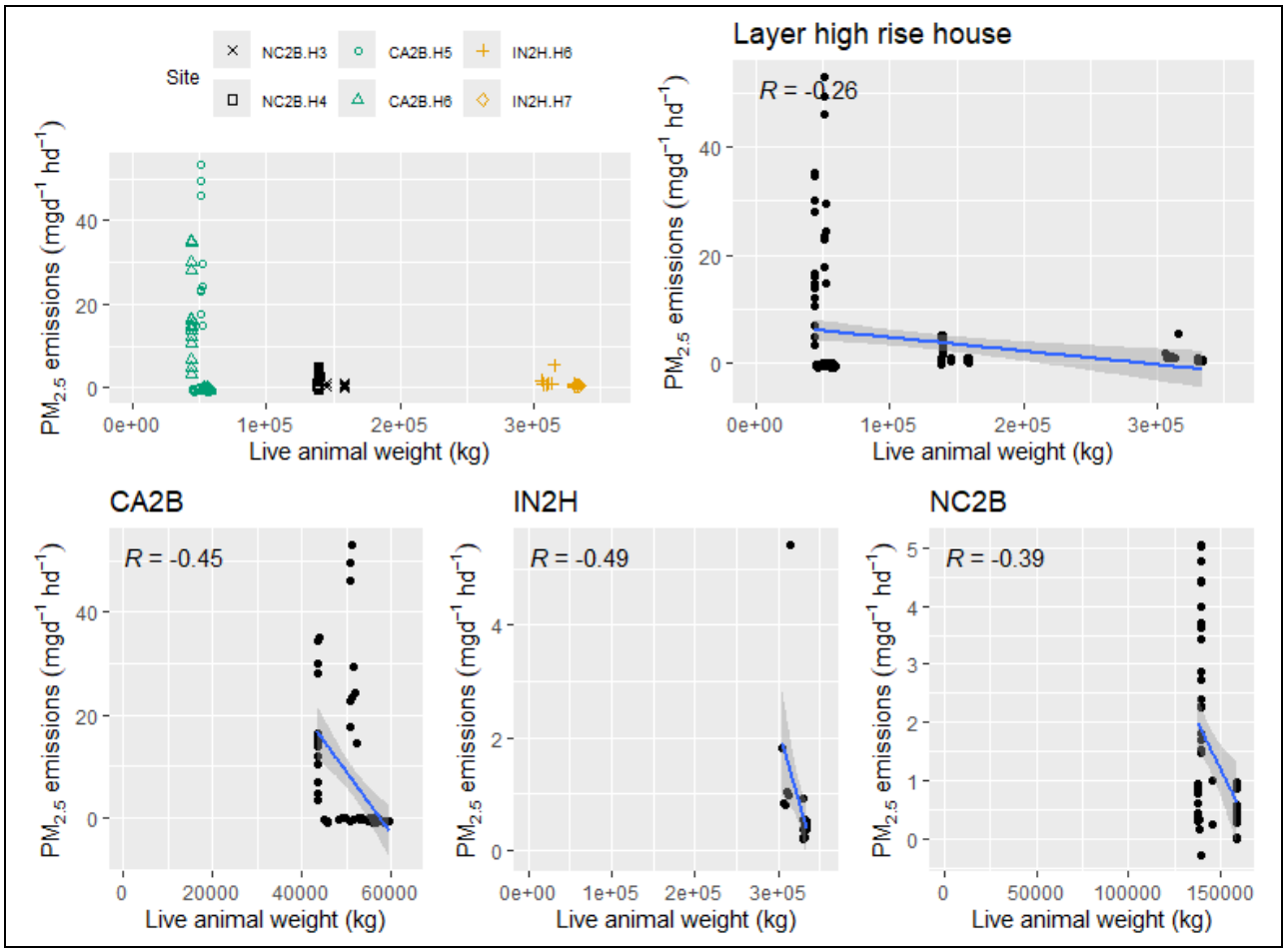

Figure 1.42: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

1.1.4.4 Exhaust temperature

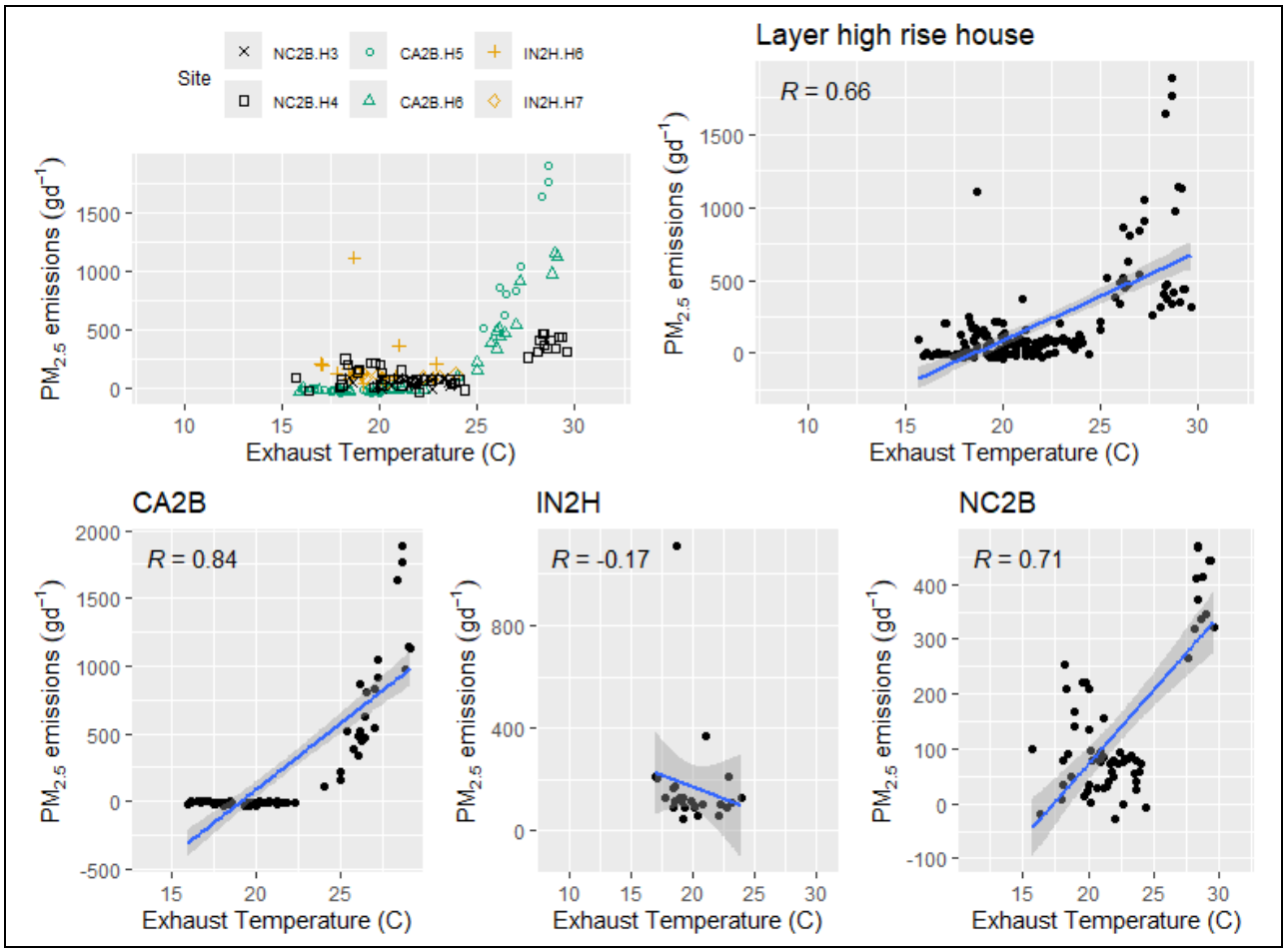

Figure 1.43: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus exhaust temperature.

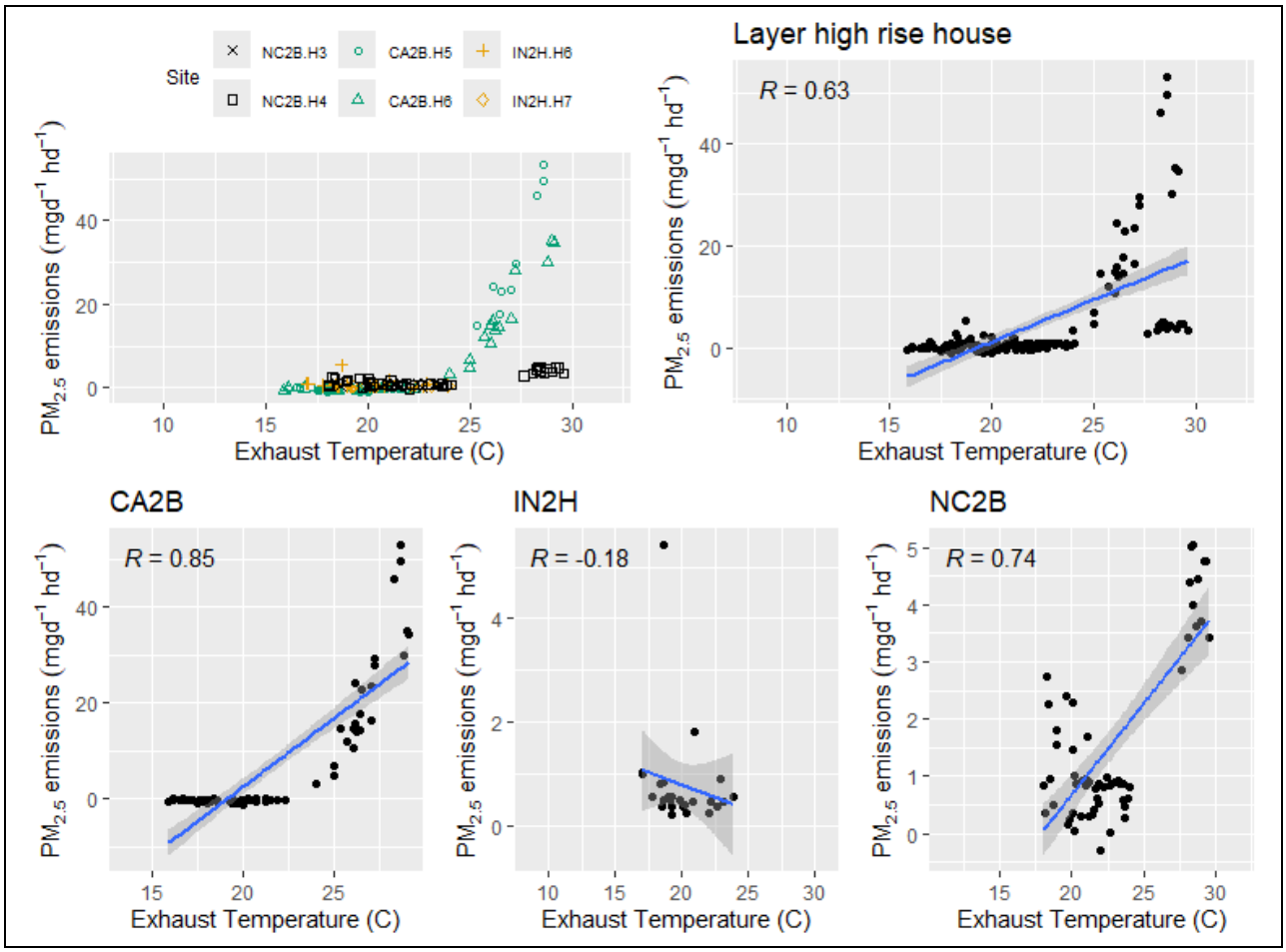

Figure 1.44: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

1.1.4.5 Exhaust relative humidity

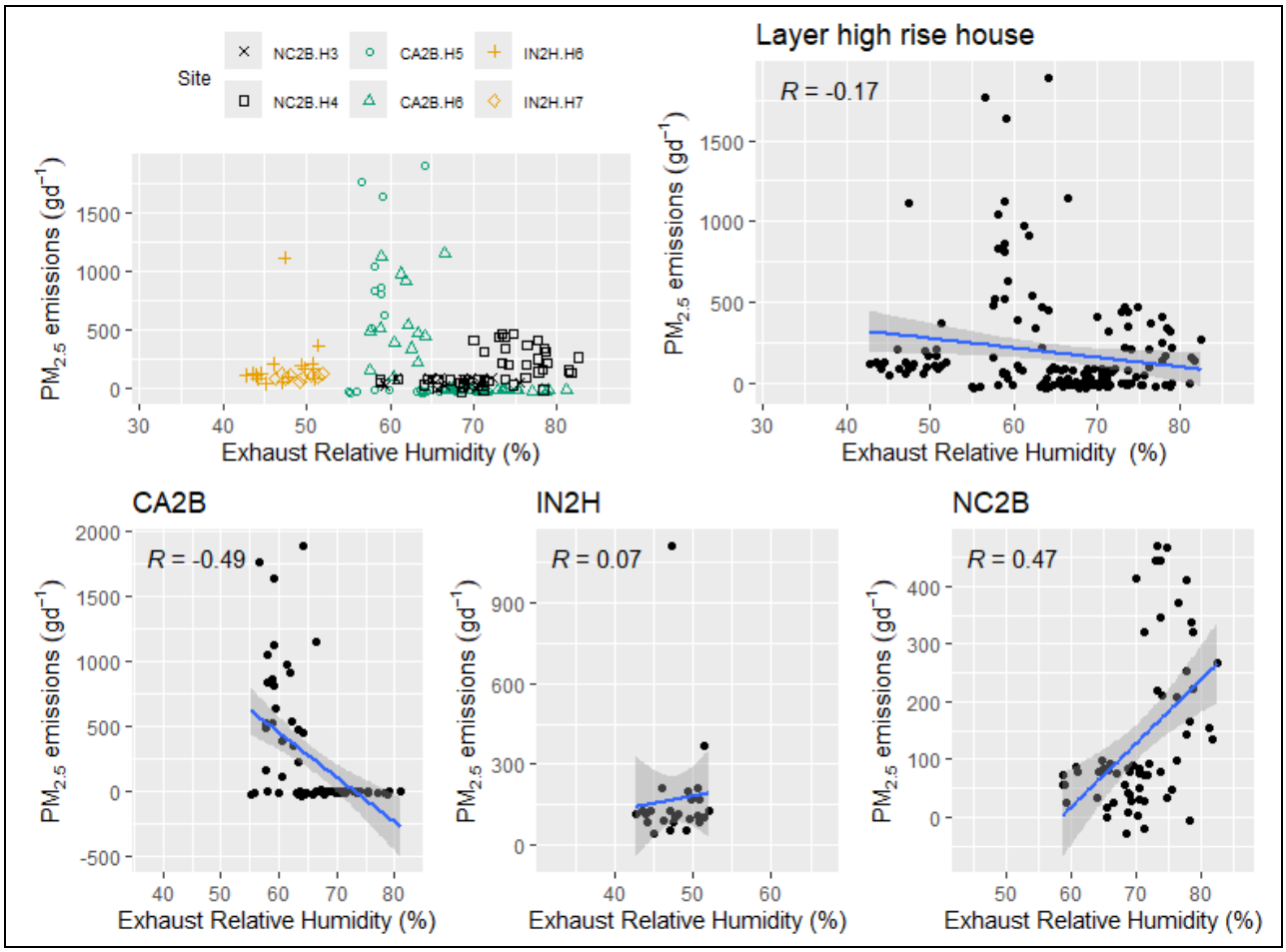

Figure 1.45: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus exhaust relative humidity.

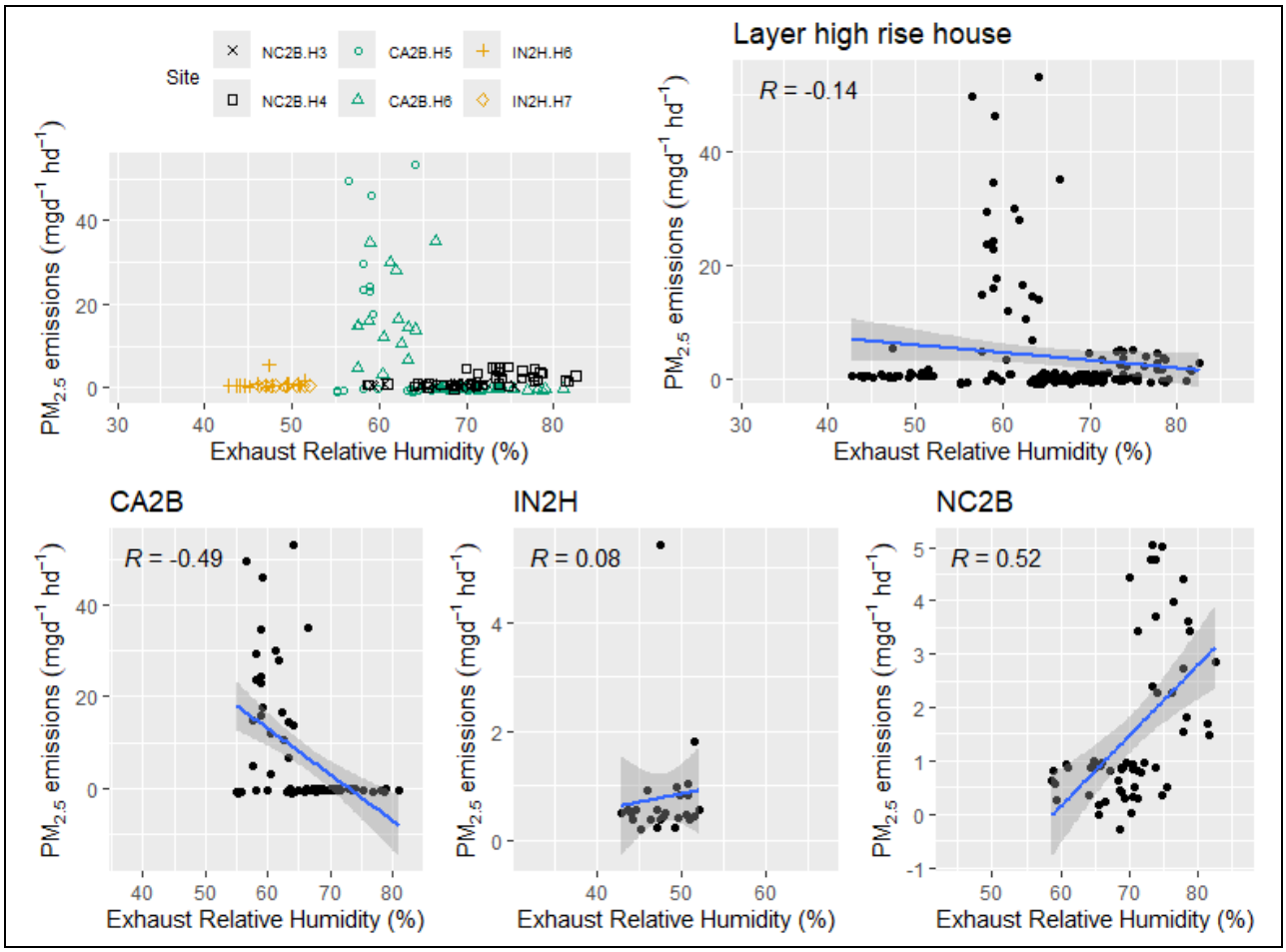

Figure 1.46: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

1.1.4.6 Airflow

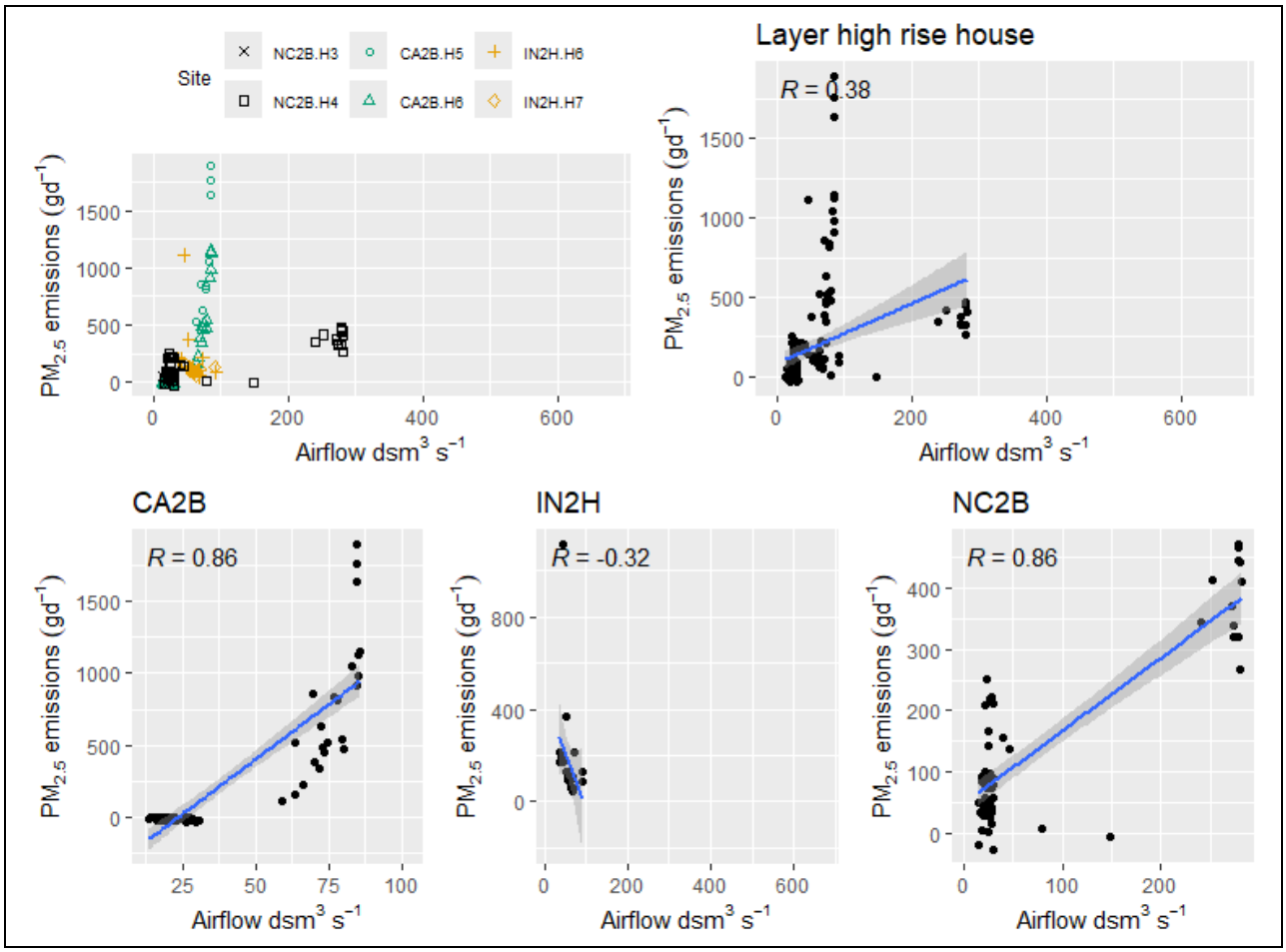

Figure 1.47: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus airflow.

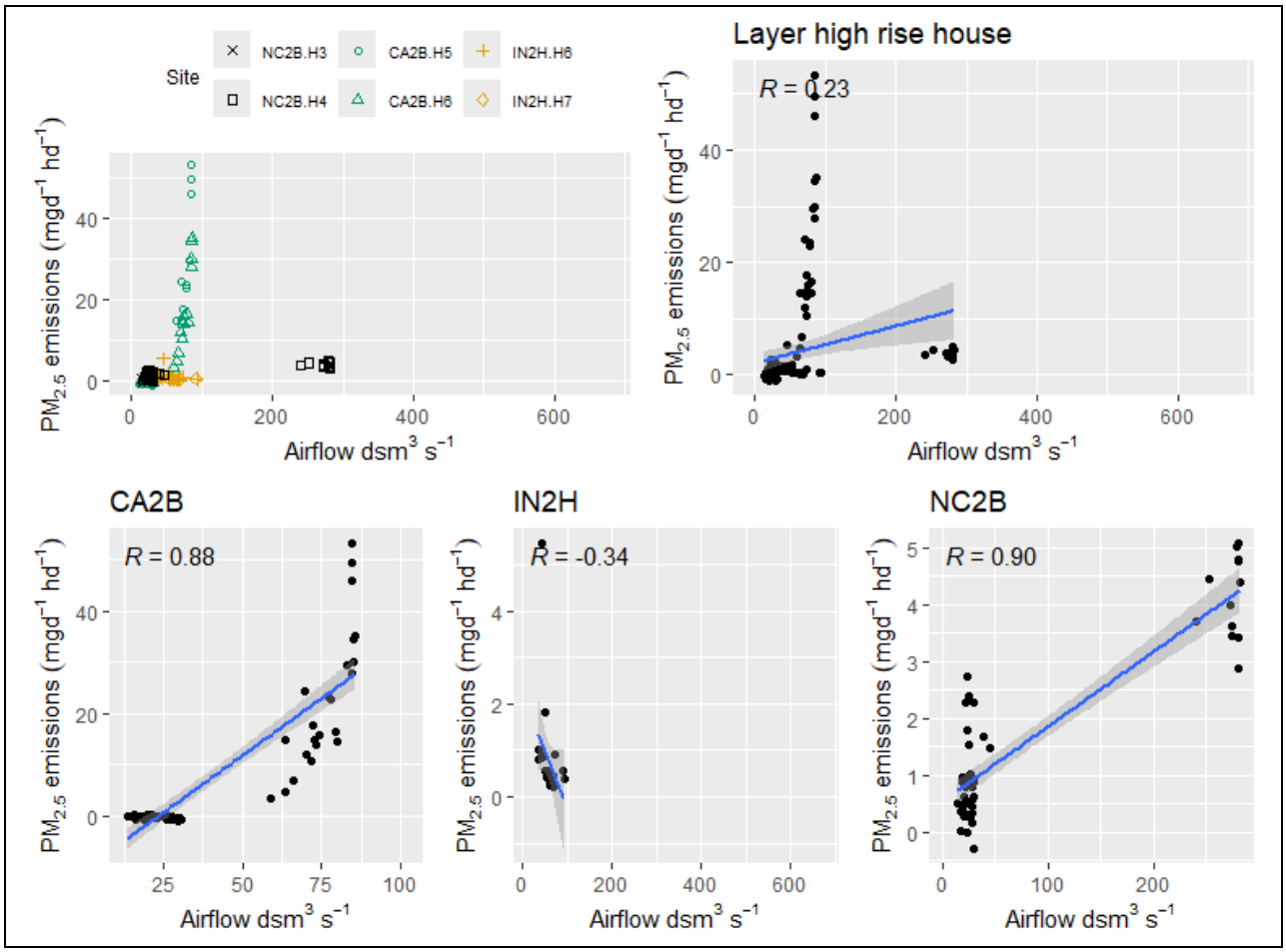

Figure 1.48: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus airflow.

1.1.5 Total Suspended Particulates (TSP)

1.1.5.1 Inventory

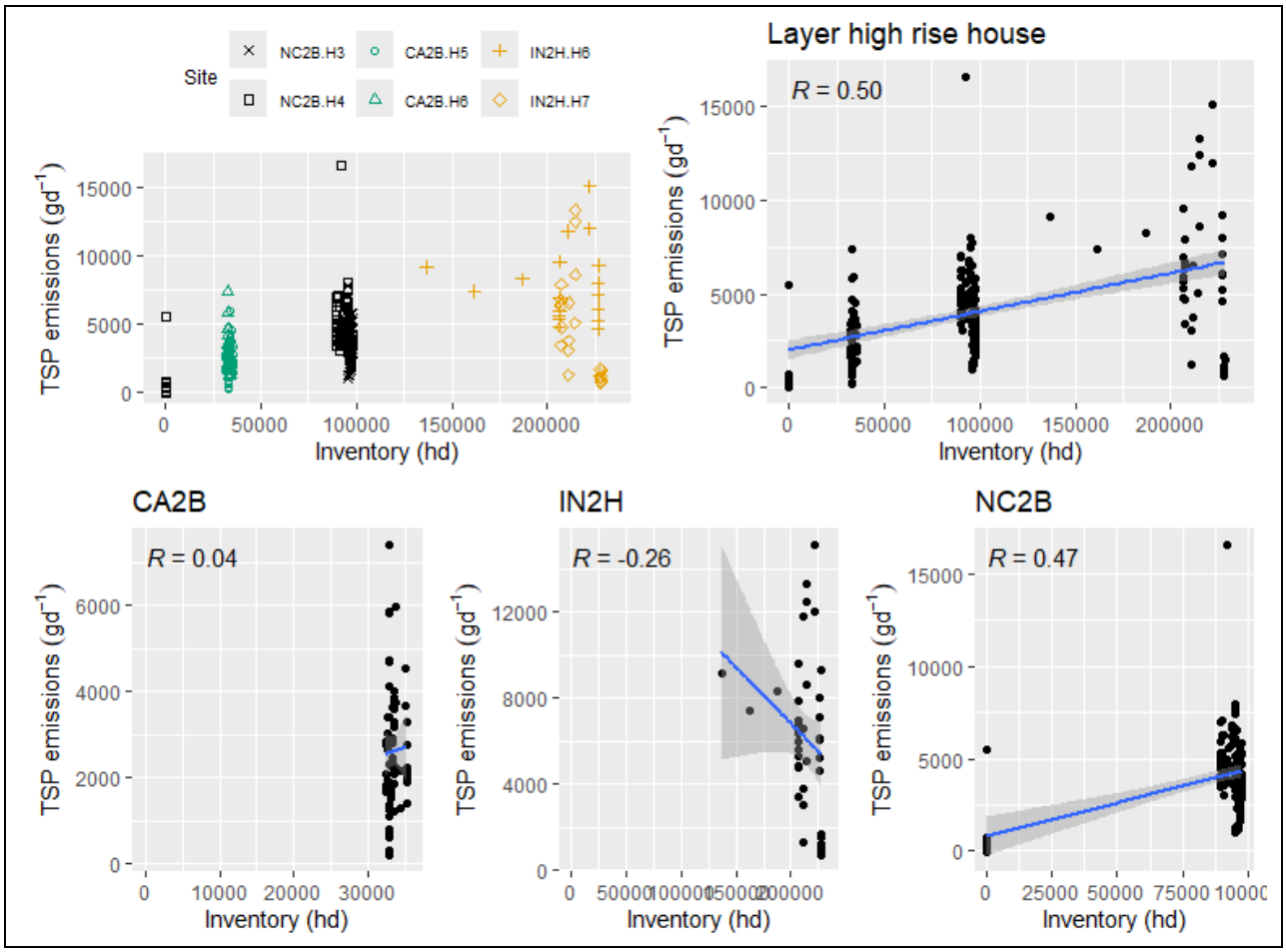

Figure 1.49: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus Inventory.

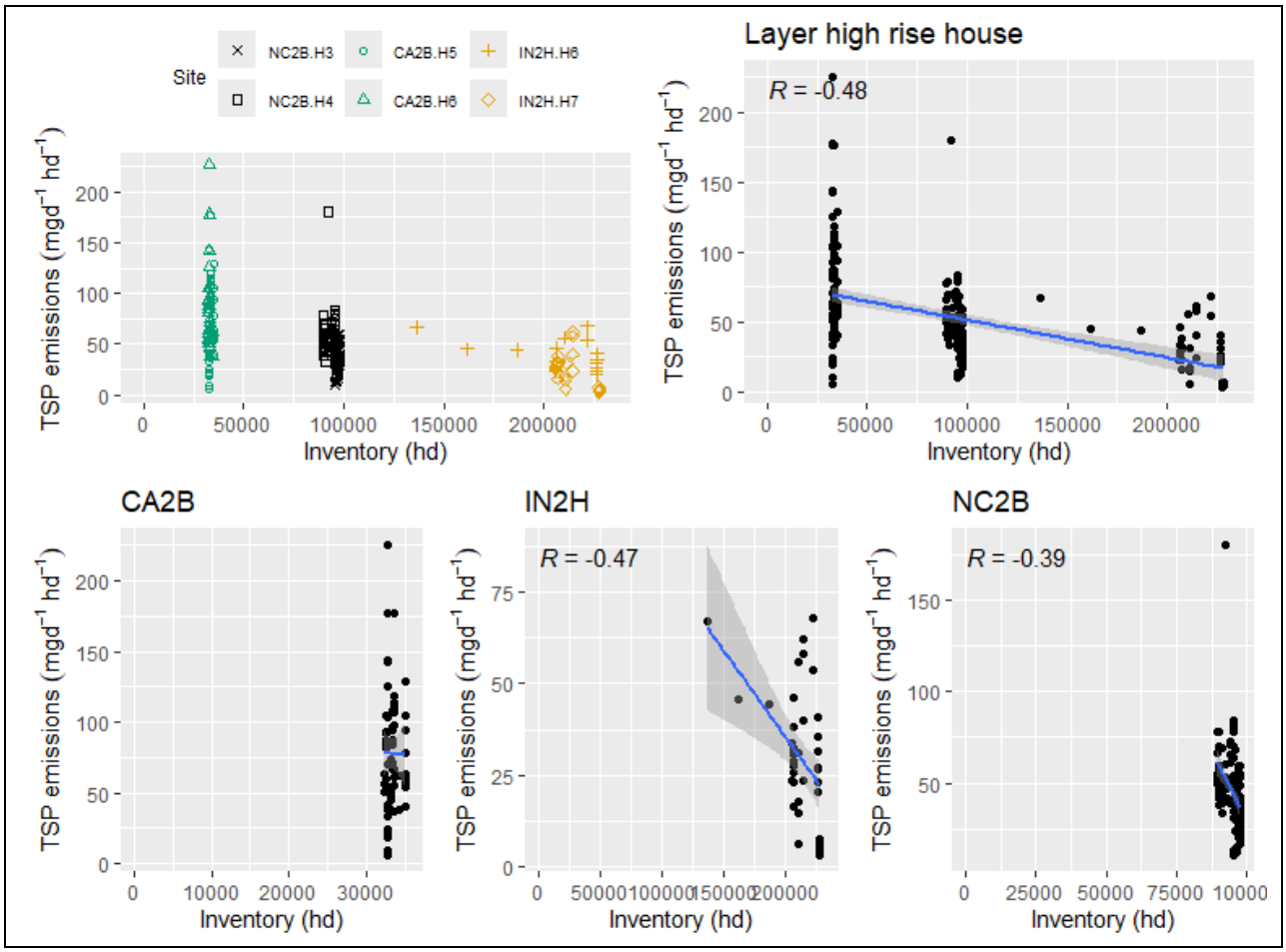

Figure 1.50: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

1.1.5.2 Average animal weight

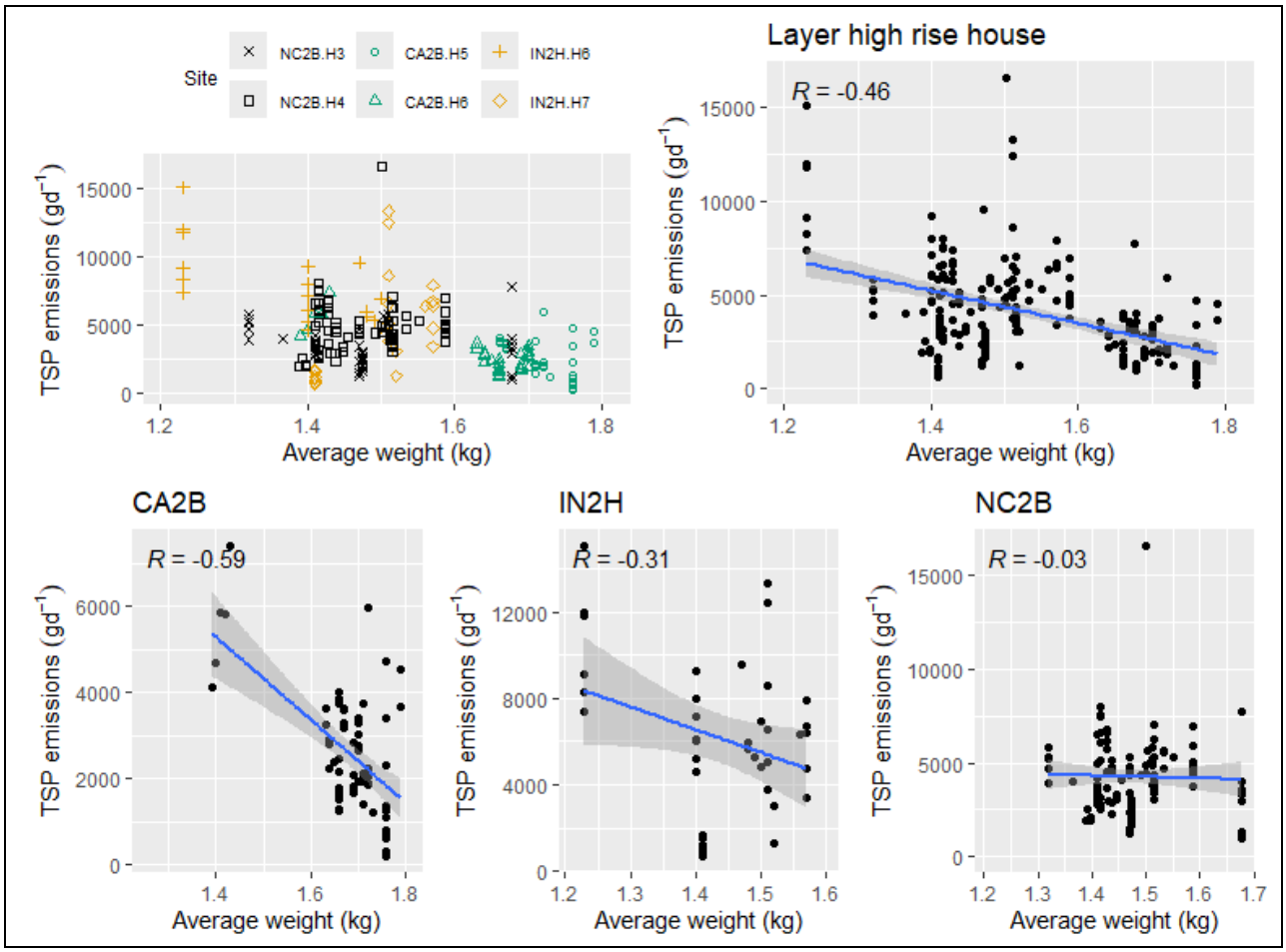

Figure 1.51: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus average animal weight.

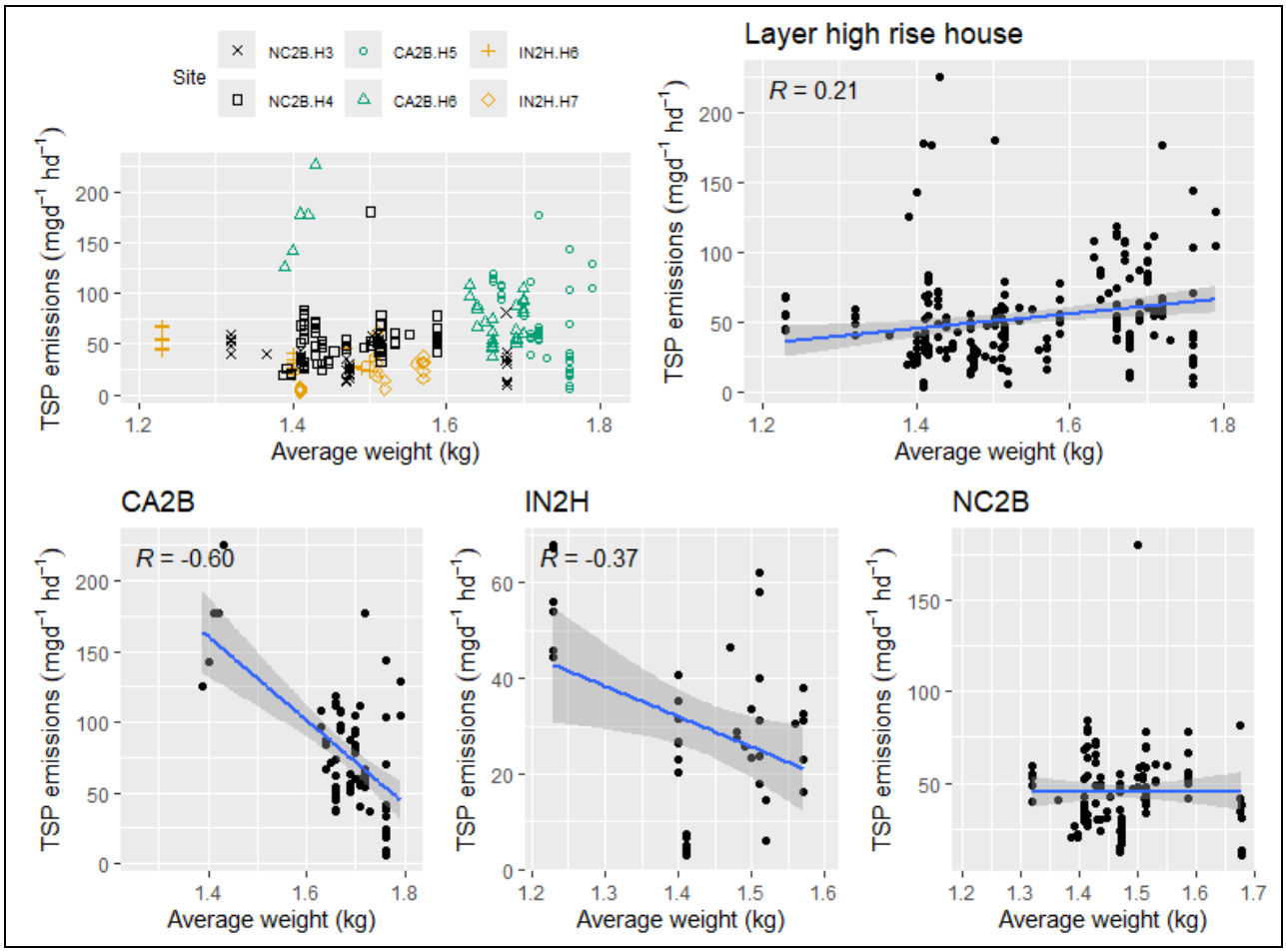

Figure 1.52: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

1.1.5.3 Live animal weight

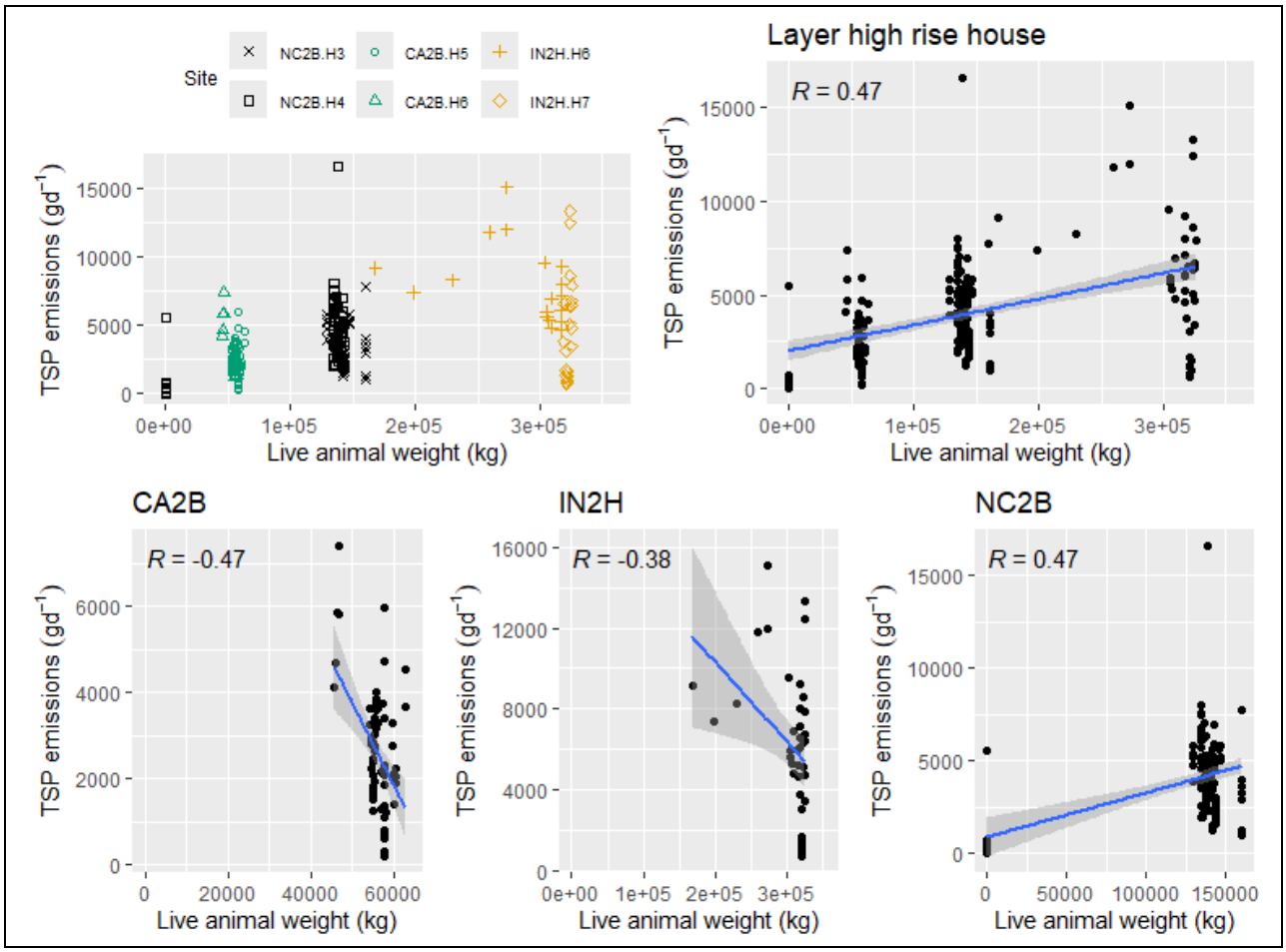

Figure 1.53: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus live animal weight.

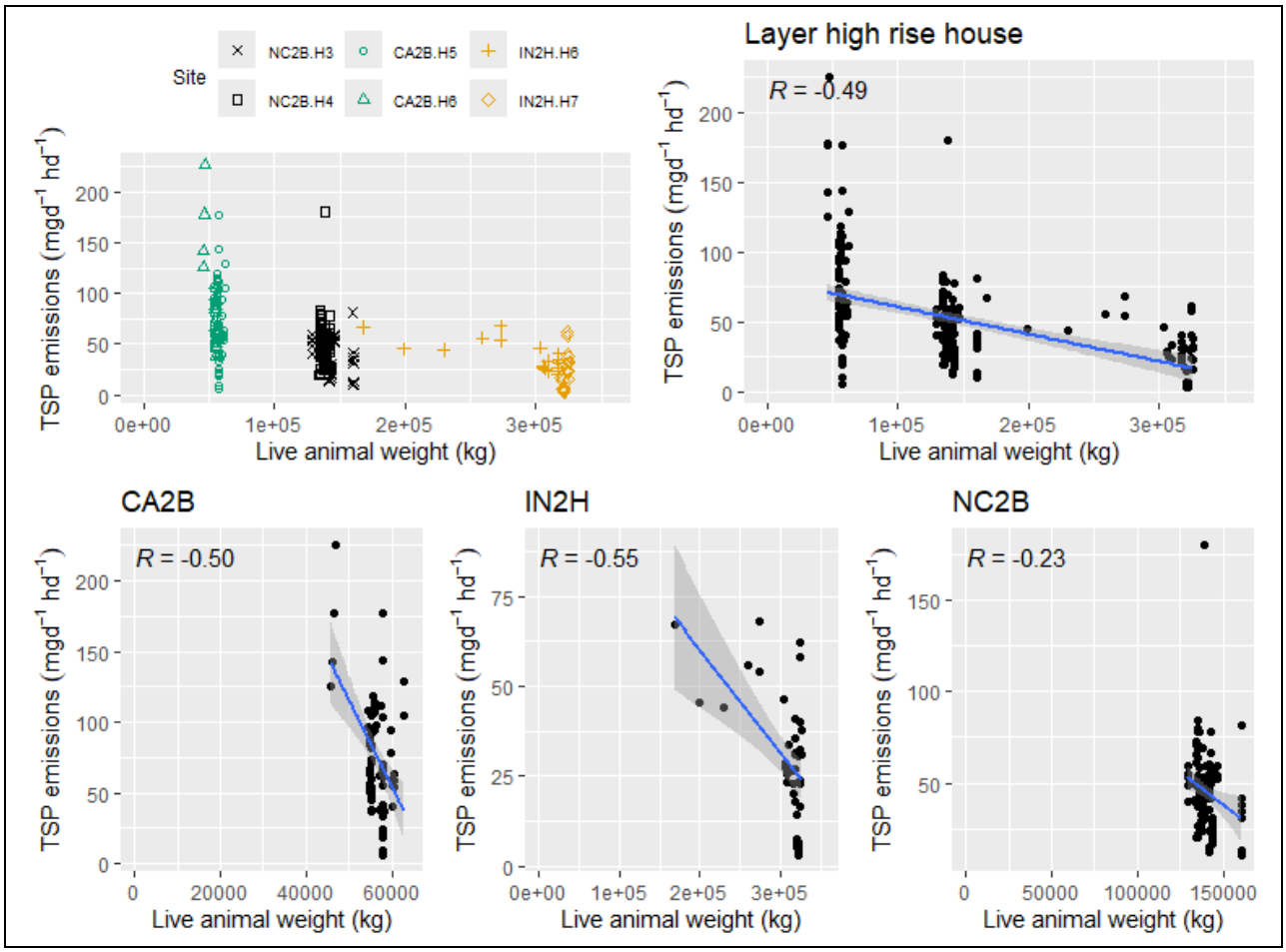

Figure 1.54: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

1.1.5.4 Exhaust temperature

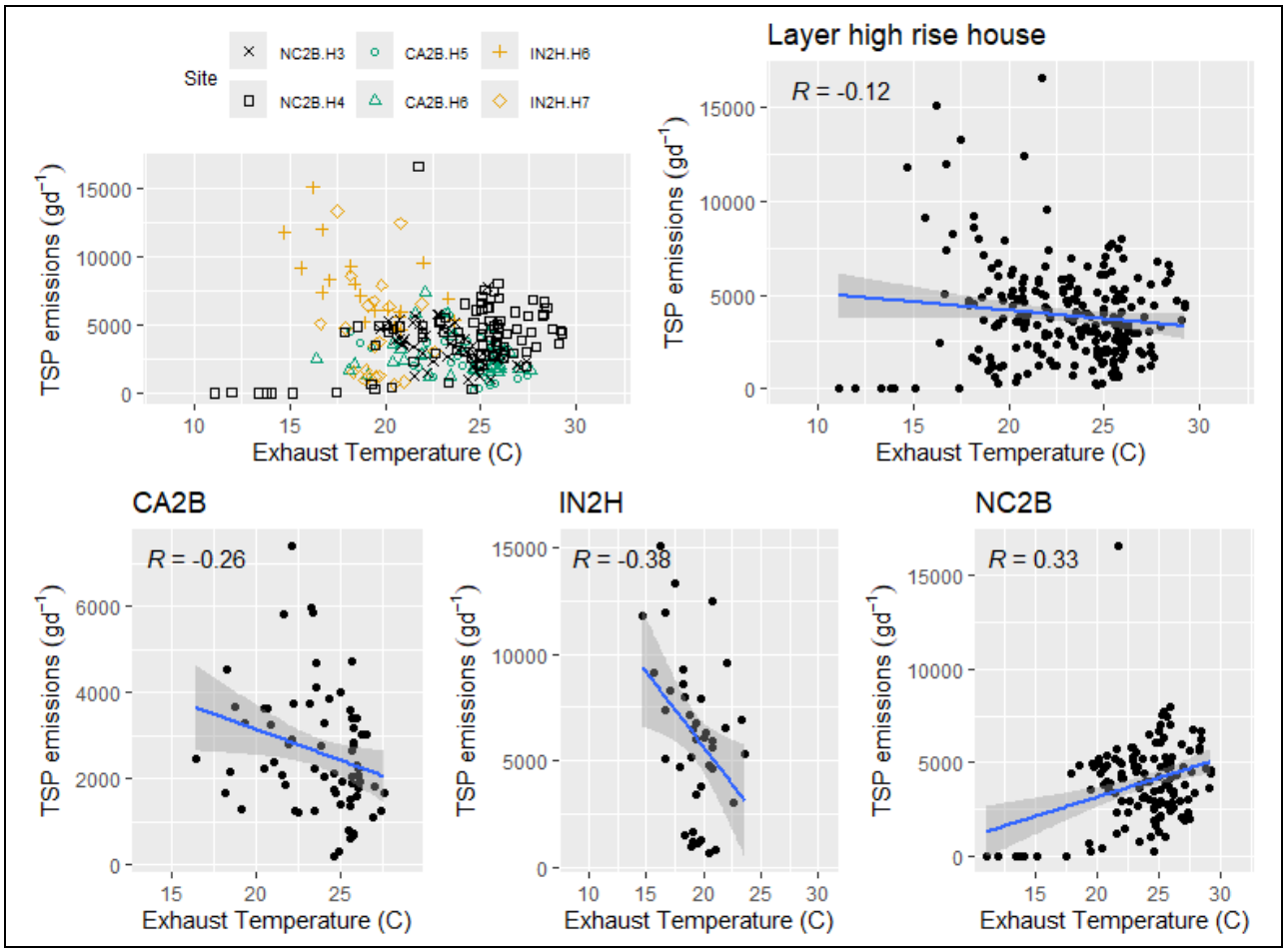

Figure 1.55: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus exhaust temperature.

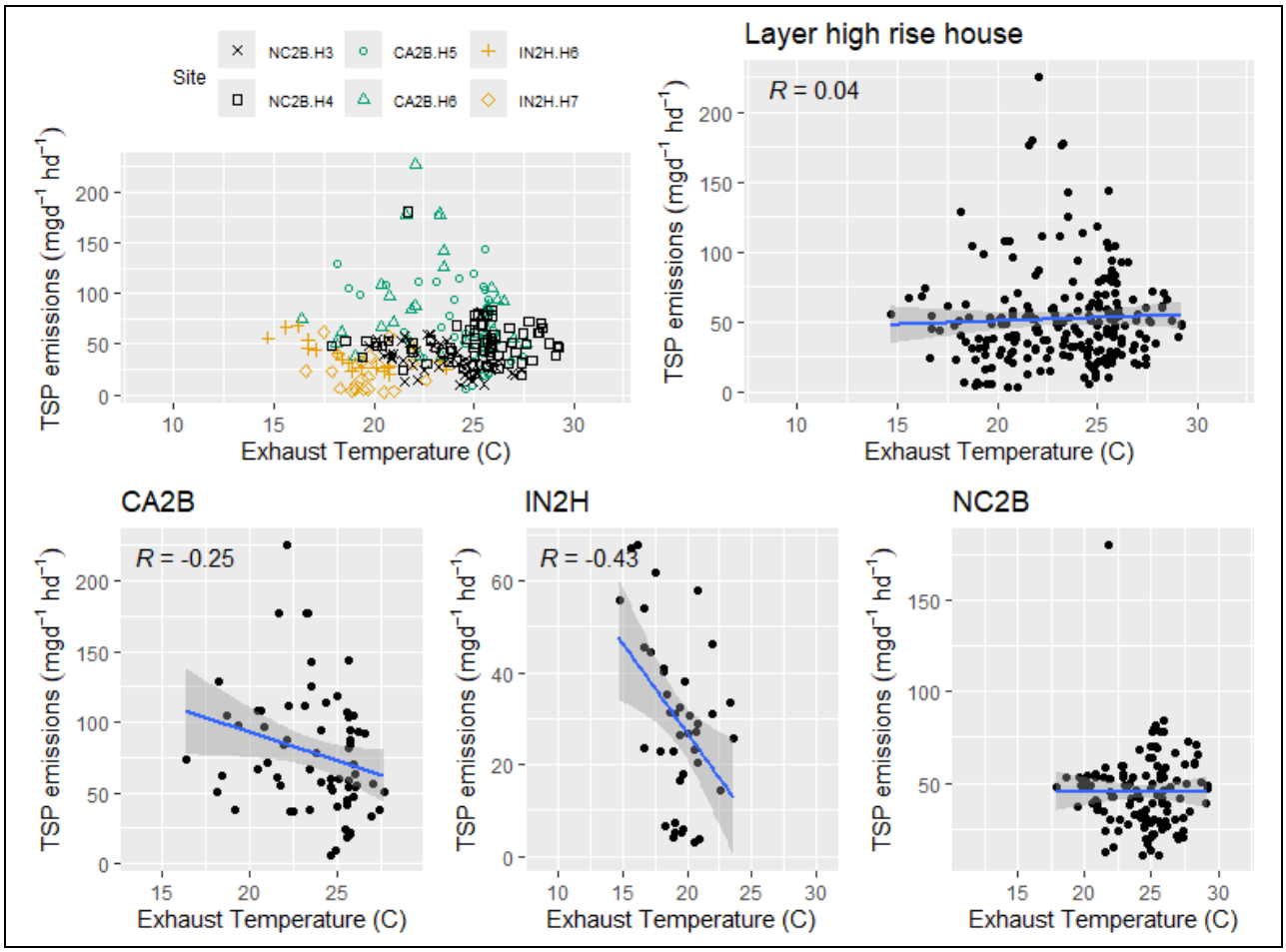

Figure 1.56: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

1.1.5.5 Exhaust relative humidity

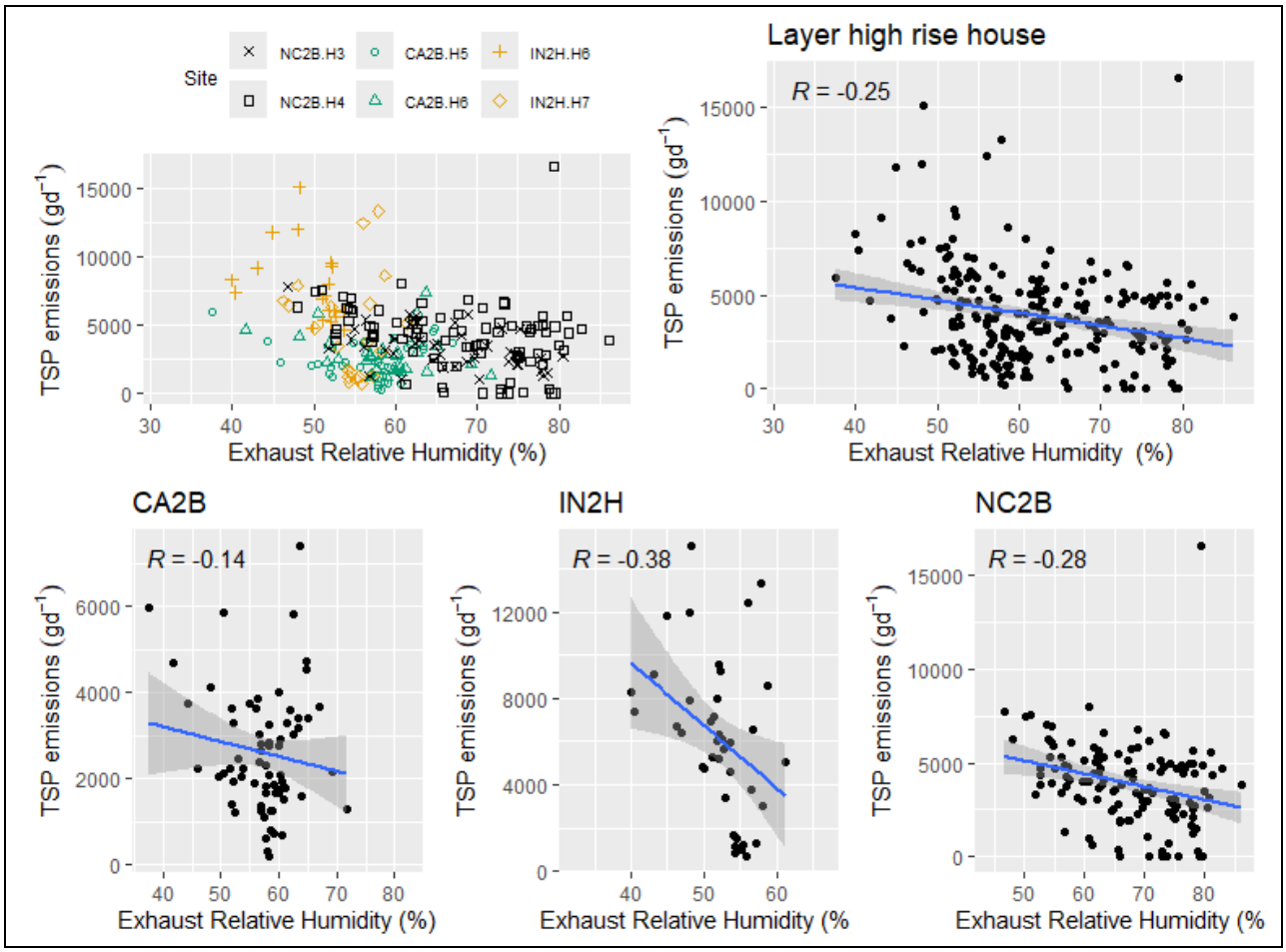

Figure 1.57: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus exhaust relative humidity.

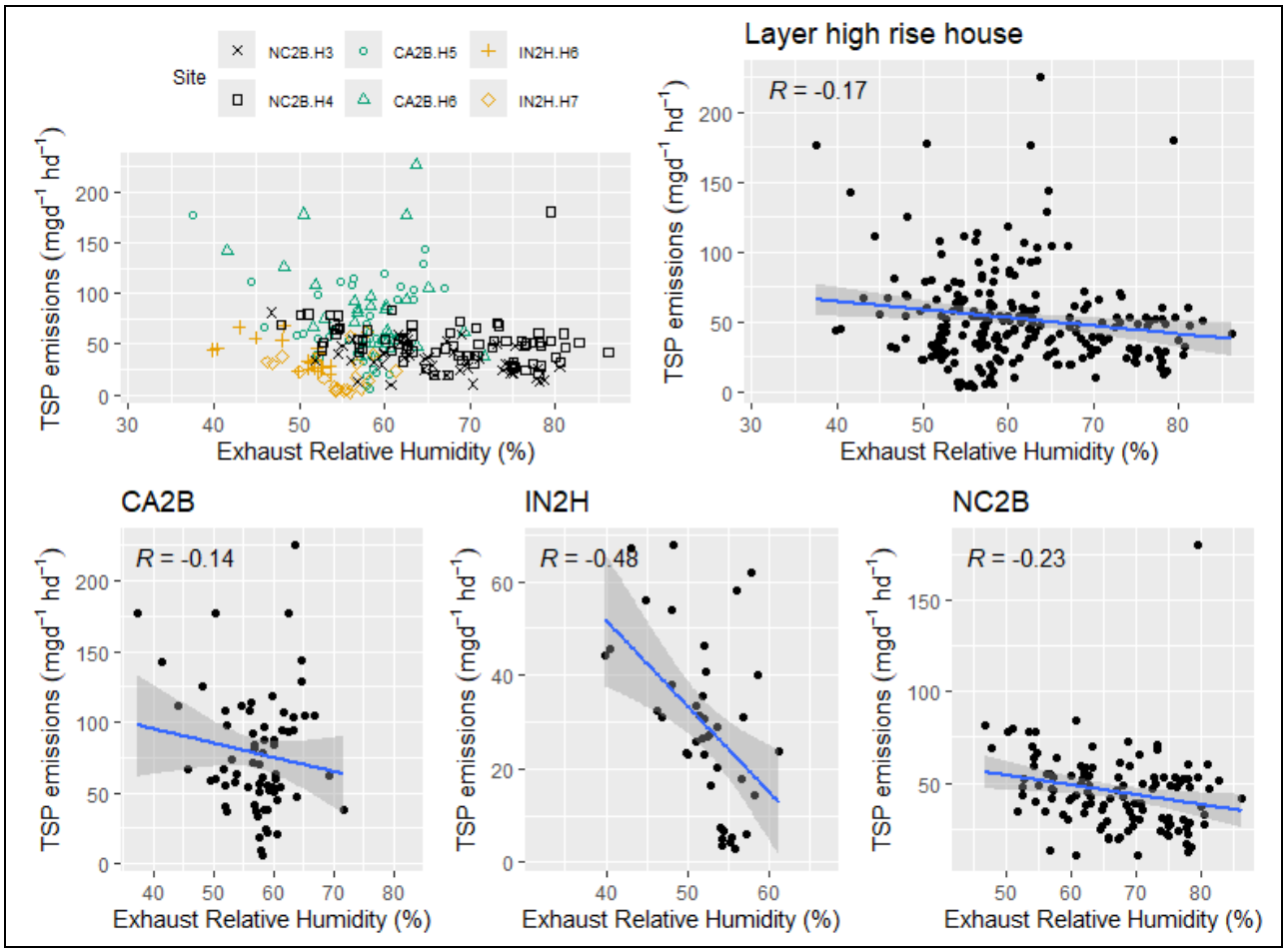

Figure 1.58: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

1.1.5.6 Airflow

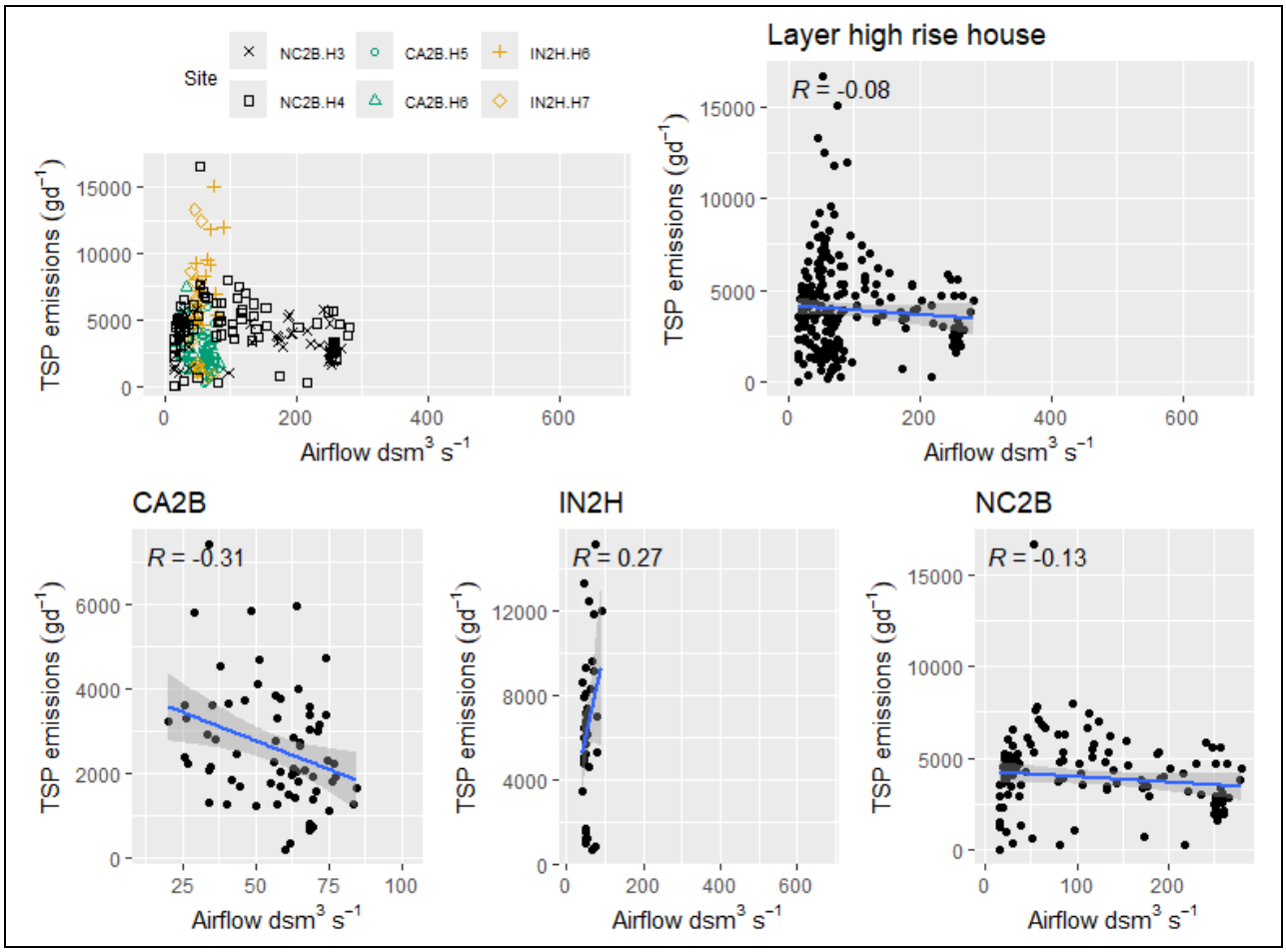

Figure 1.59: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus airflow.

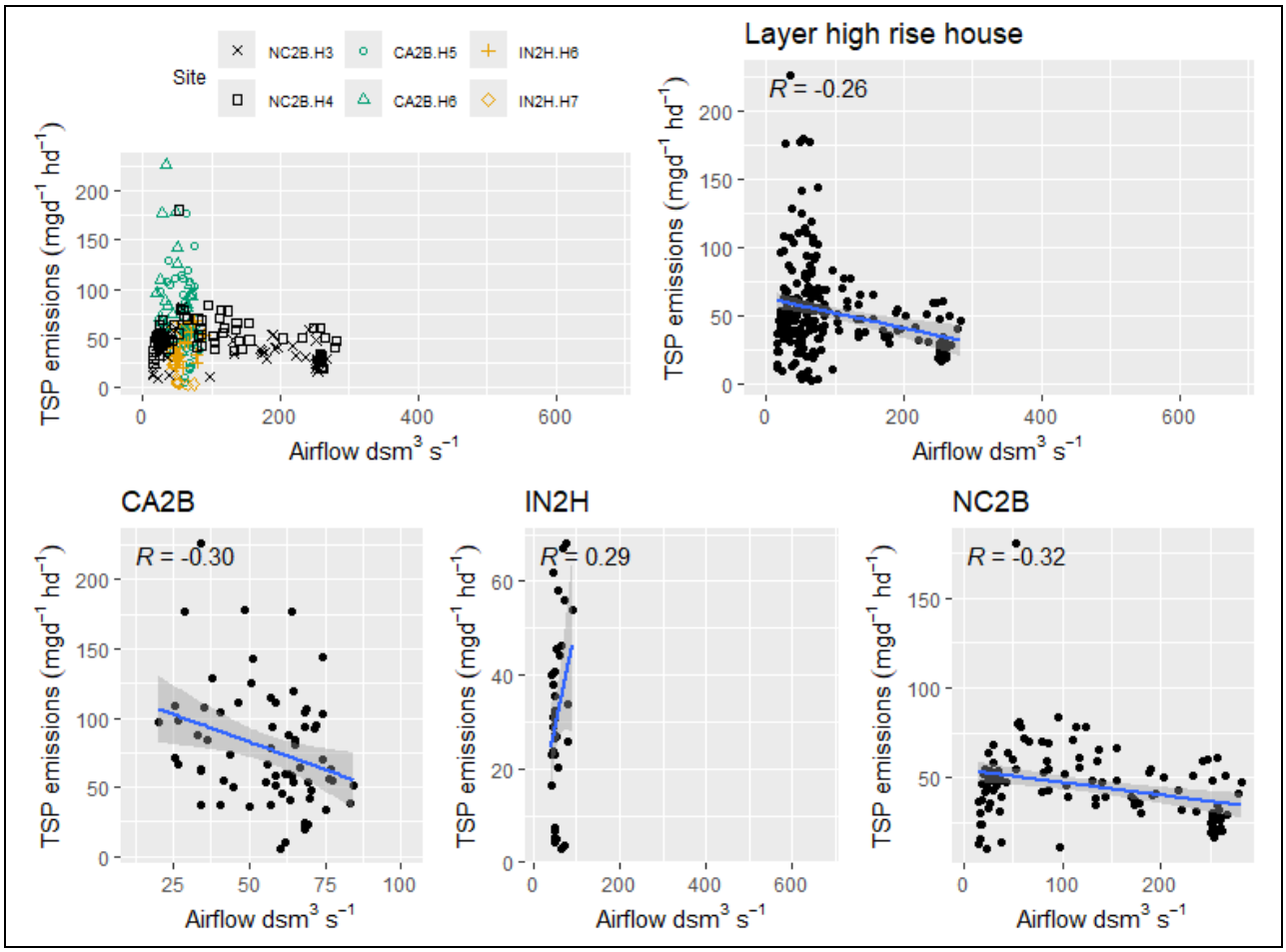

Figure 1.60: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus airflow.

1.2 Ambient

Table 1.2: Summary of layer high rise house R^{-2} values for ambient parameters.

Emissions	Parameter	R	R2	Strength
NH_3 (kgd^{-1})	Ambient Temperature (C)	-0.34	0.12	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Ambient Temperature (C)	-0.17	0.03	slight or weak
NH_3 (kgd^{-1})	Ambient Relative humidity (%)	0.26	0.07	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.17	0.03	slight or weak
H_2S (gd^{-1})	Ambient Temperature (C)	0.19	0.04	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.26	0.07	slight or weak
H_2S (gd^{-1})	Ambient Relative humidity (%)	0.09	0.01	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.03	0	slight or weak
PM_{10} (gd^{-1})	Ambient Temperature (C)	0.15	0.02	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.23	0.05	slight or weak
PM_{10} (gd^{-1})	Ambient Relative humidity (%)	-0.05	0	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	-0.19	0.04	slight or weak
$PM_{2.5}$ (gd^{-1})	Ambient Temperature (C)	0.64	0.41	moderate
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.68	0.46	moderate
$PM_{2.5}$ (gd^{-1})	Ambient Relative humidity (%)	-0.45	0.21	modest
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	-0.51	0.26	modest
TSP (gd^{-1})	Ambient Temperature (C)	-0.31	0.1	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.18	0.03	slight or weak
TSP (gd^{-1})	Ambient Relative humidity (%)	0.07	0.01	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	-0.38	0.15	slight or weak

1.2.1 Ammonia (NH_3)

1.2.1.1 Ambient temperature

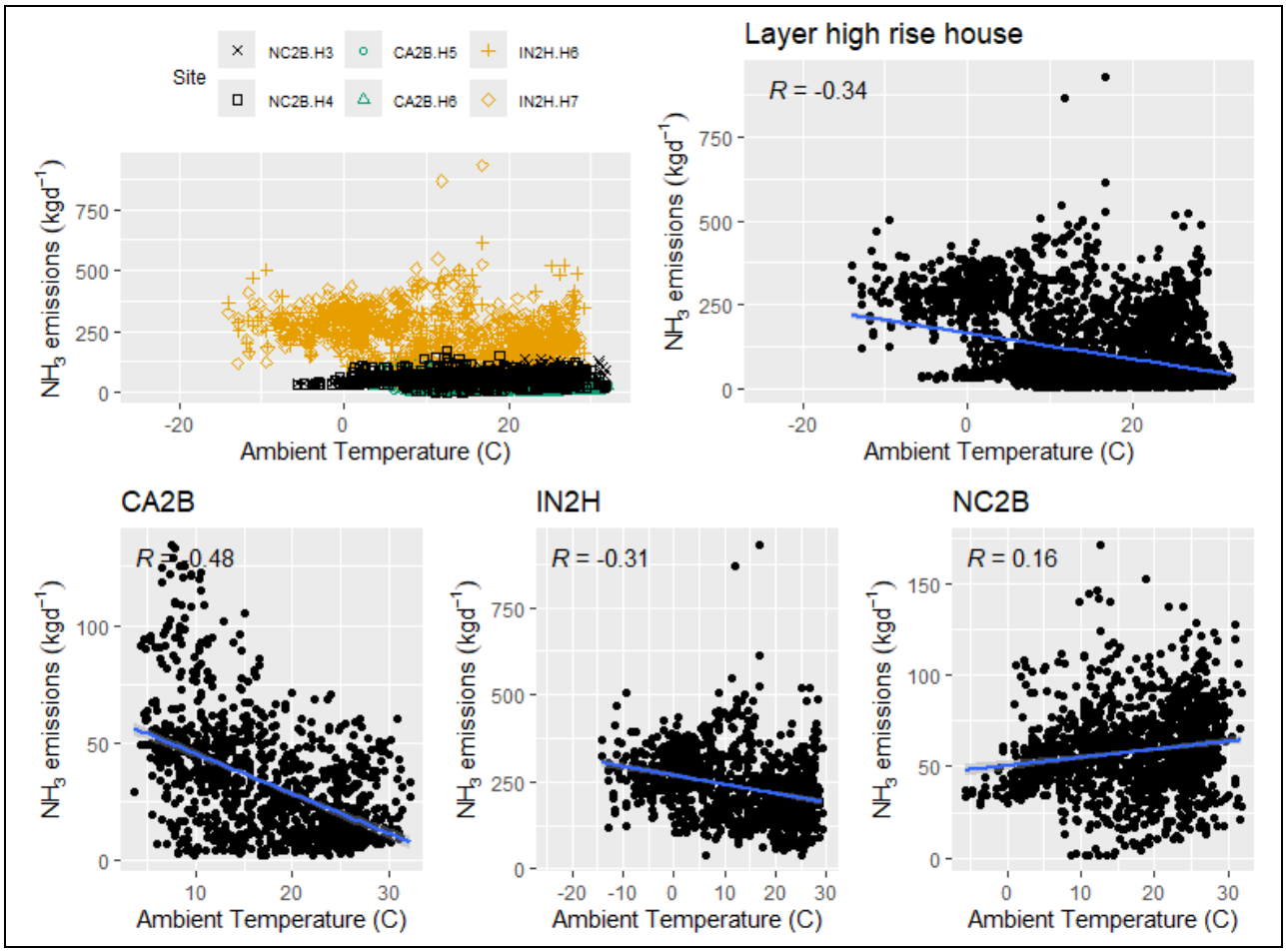

Figure 1.61: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus ambient temperature.

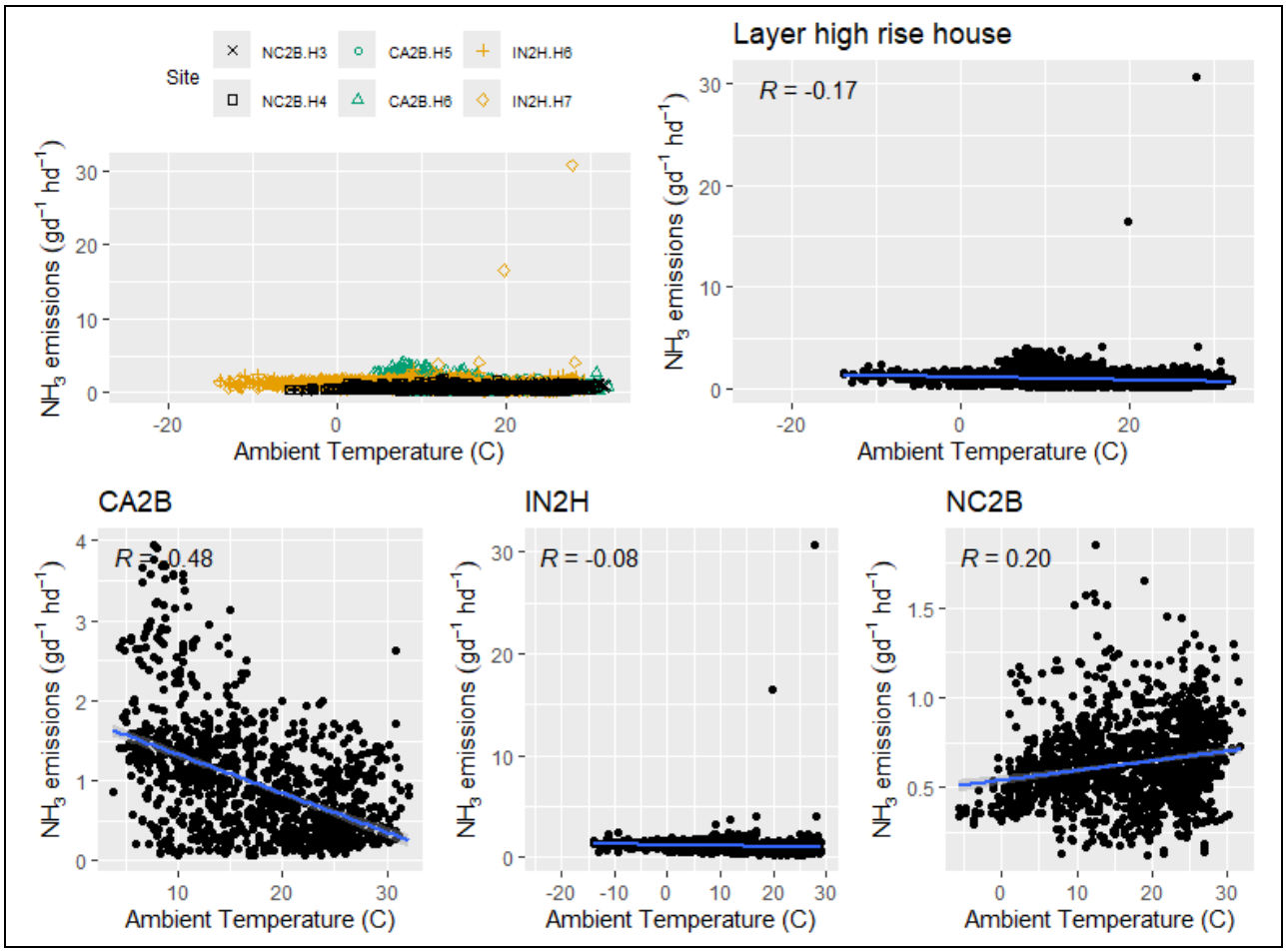

Figure 1.62: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus ambient temperature.

1.2.1.2 Ambient relative humidity

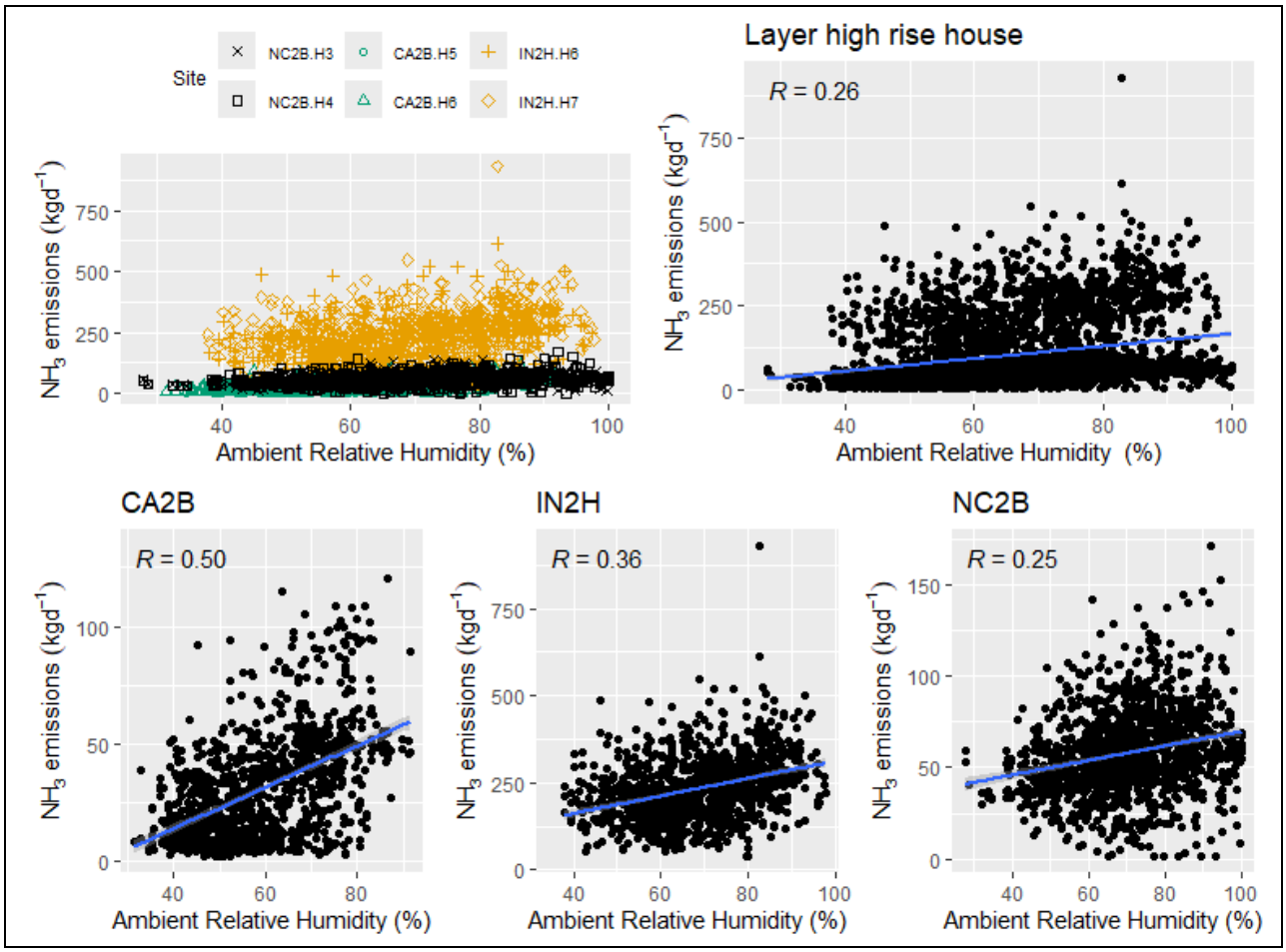

Figure 1.63: Scatter plot of layer high rise house NH_3 emissions (kg d^{-1}) versus ambient relative humidity.

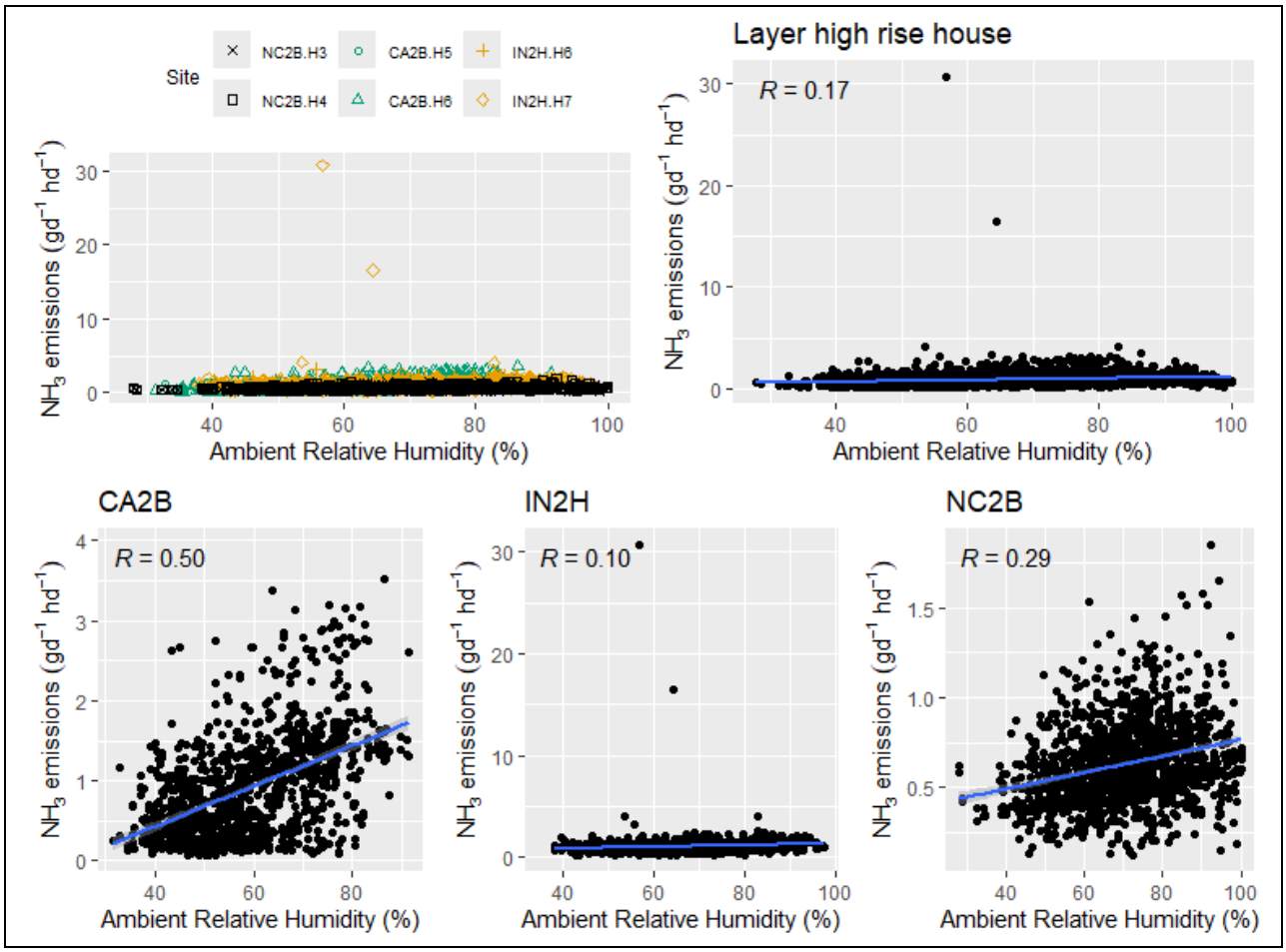

Figure 1.64: Scatter plot of layer high rise house NH_3 emissions (g $d^{-1}hd^{-1}$) versus ambient relative humidity.

1.2.2 Hydrogen Sulfide (H_2S)

1.2.2.1 Ambient temperature

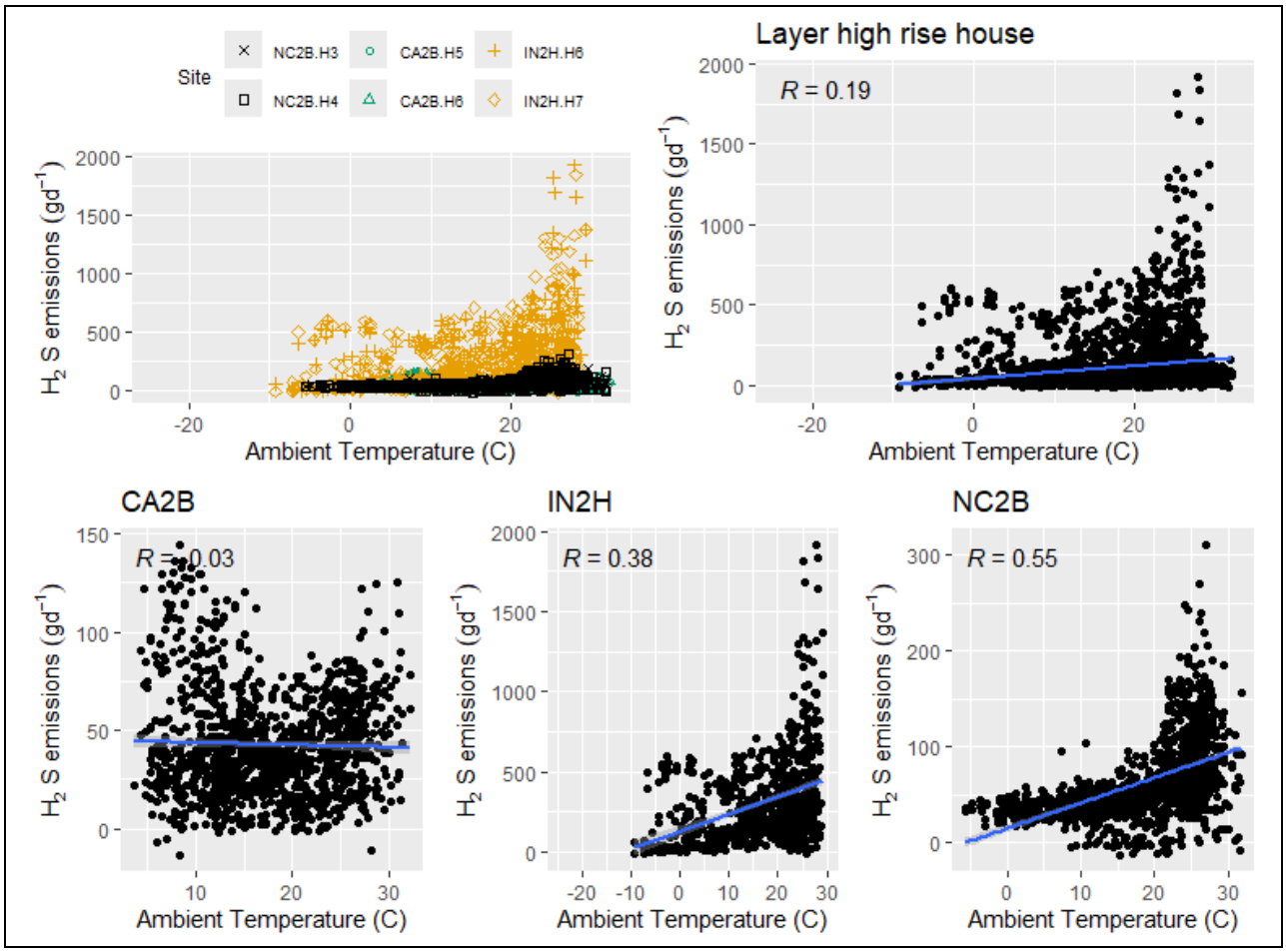

Figure 1.65: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus ambient temperature.

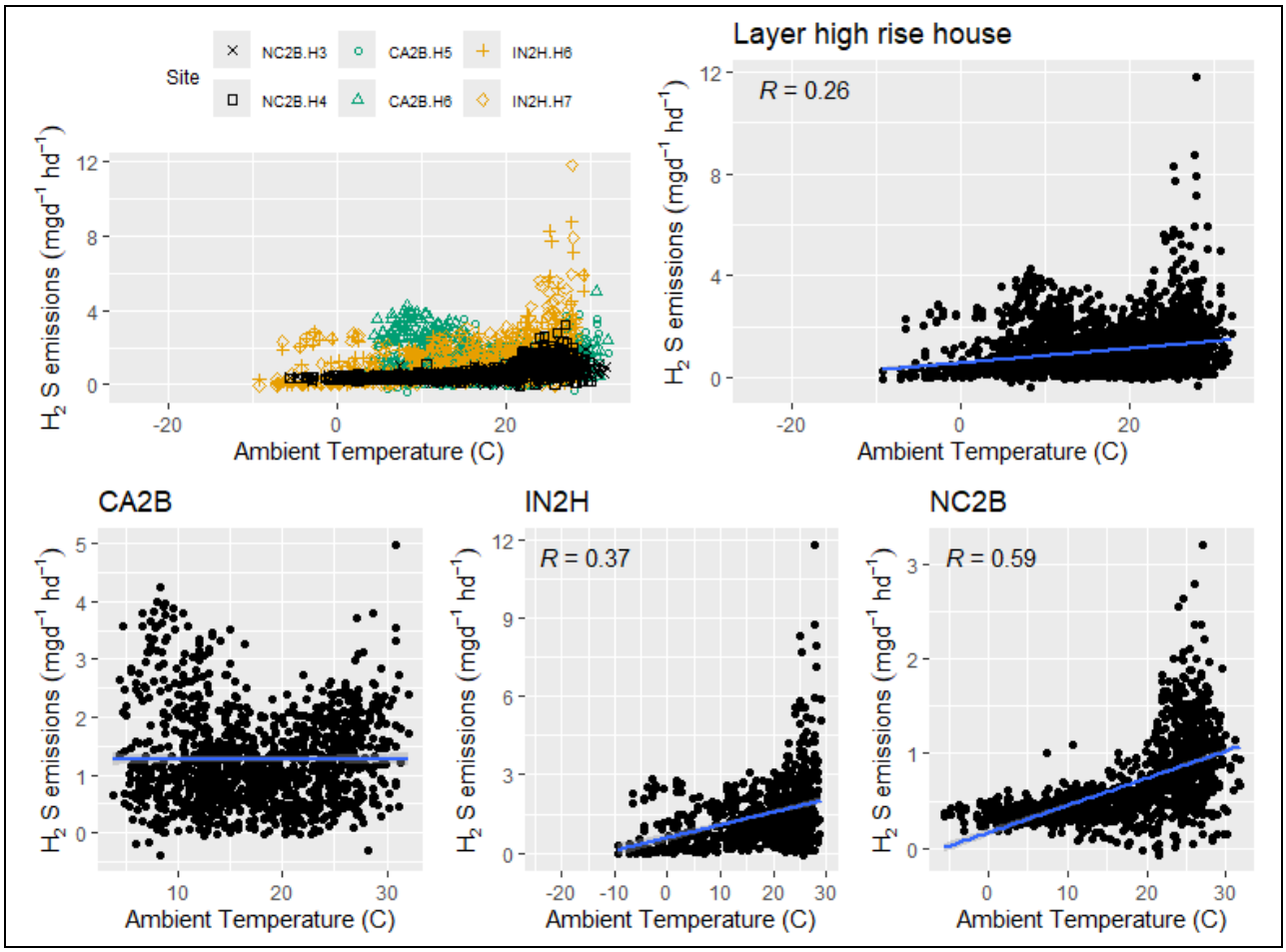

Figure 1.66: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

1.2.2.2 Ambient relative humidity

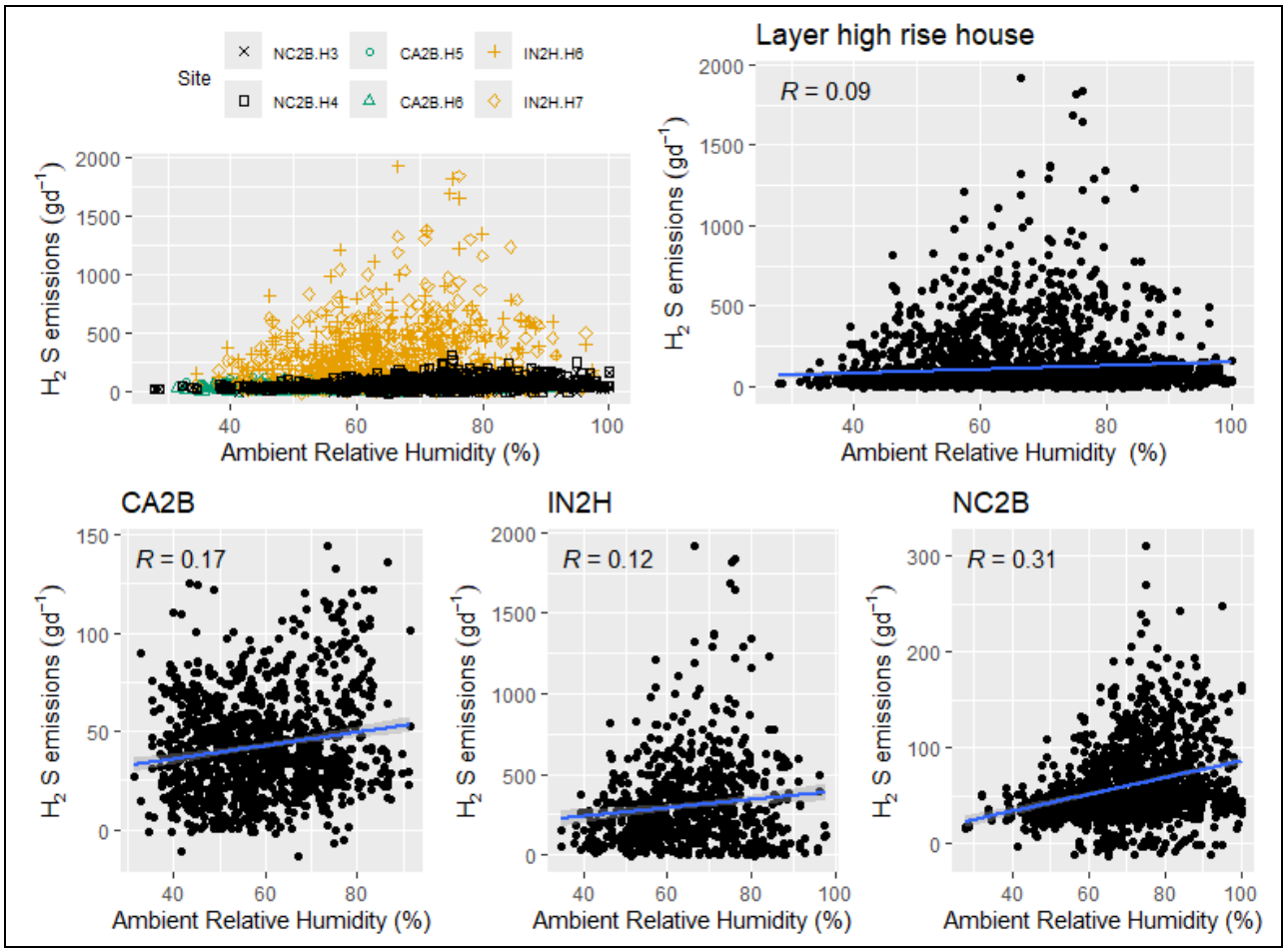

Figure 1.67: Scatter plot of layer high rise house H_2S emissions (g d^{-1}) versus ambient relative humidity.

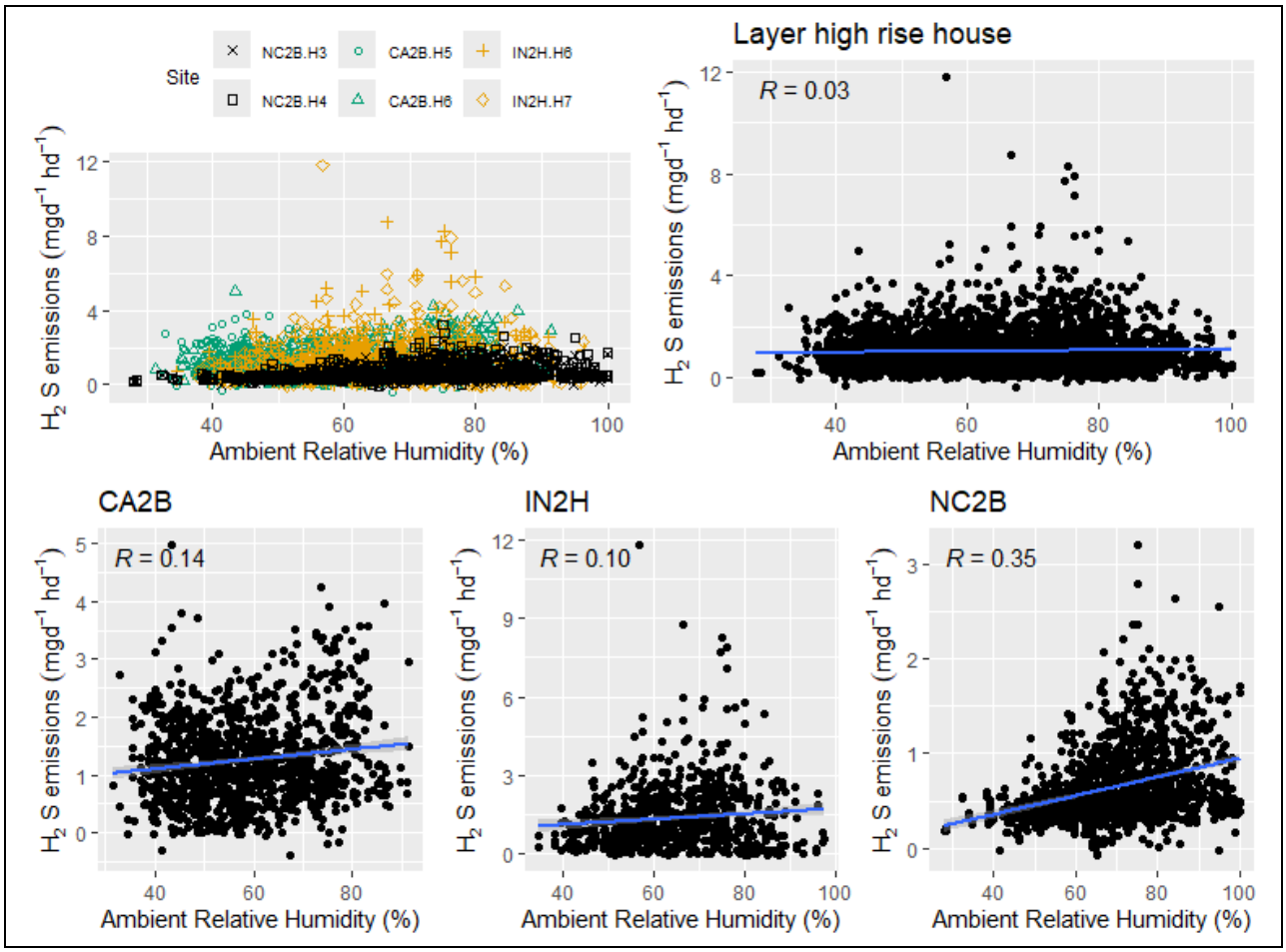

Figure 1.68: Scatter plot of layer high rise house H_2S emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

1.2.3 Particulate Matter (PM_{10})

1.2.3.1 Ambient temperature

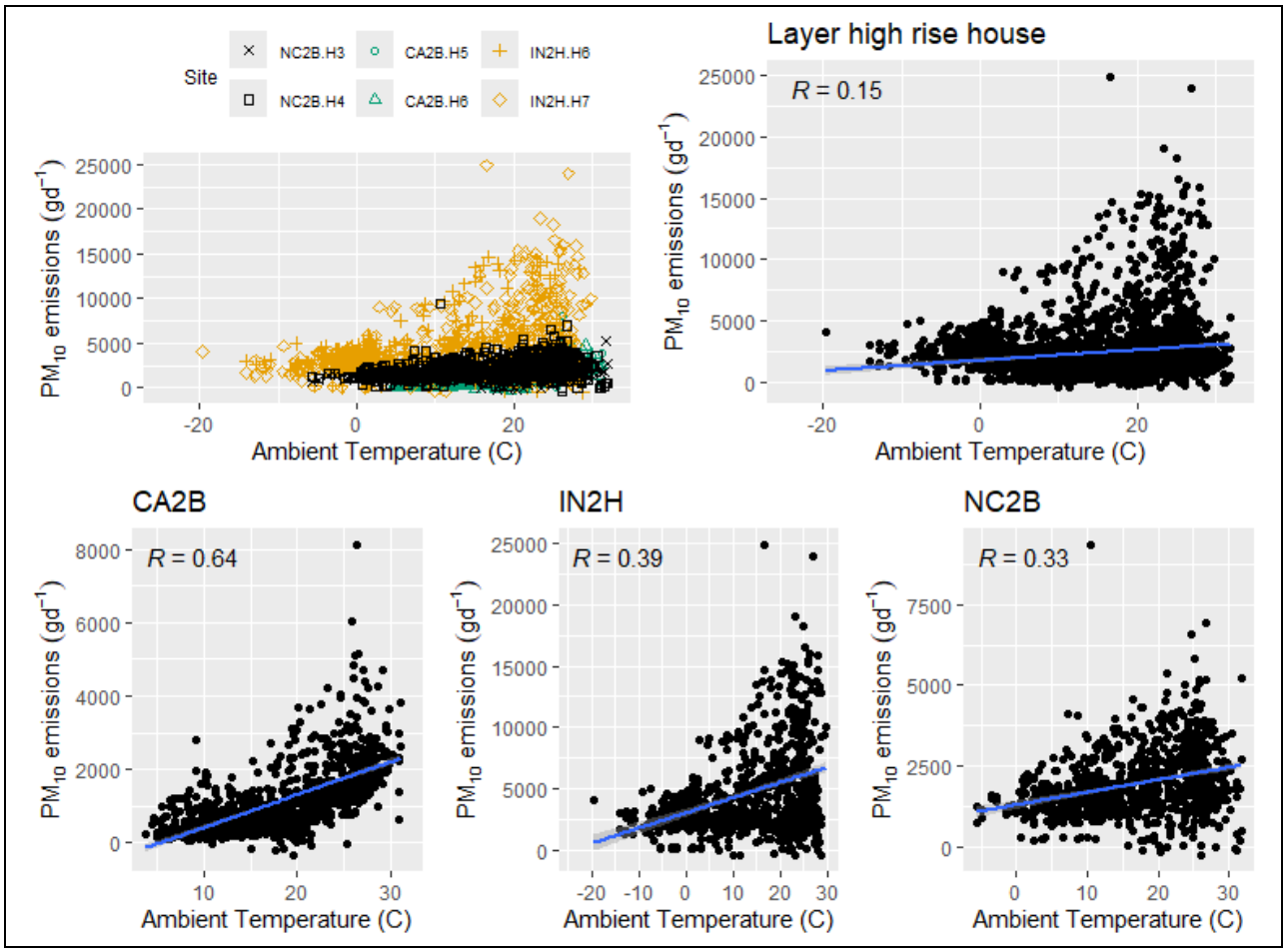

Figure 1.69: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus ambient temperature.

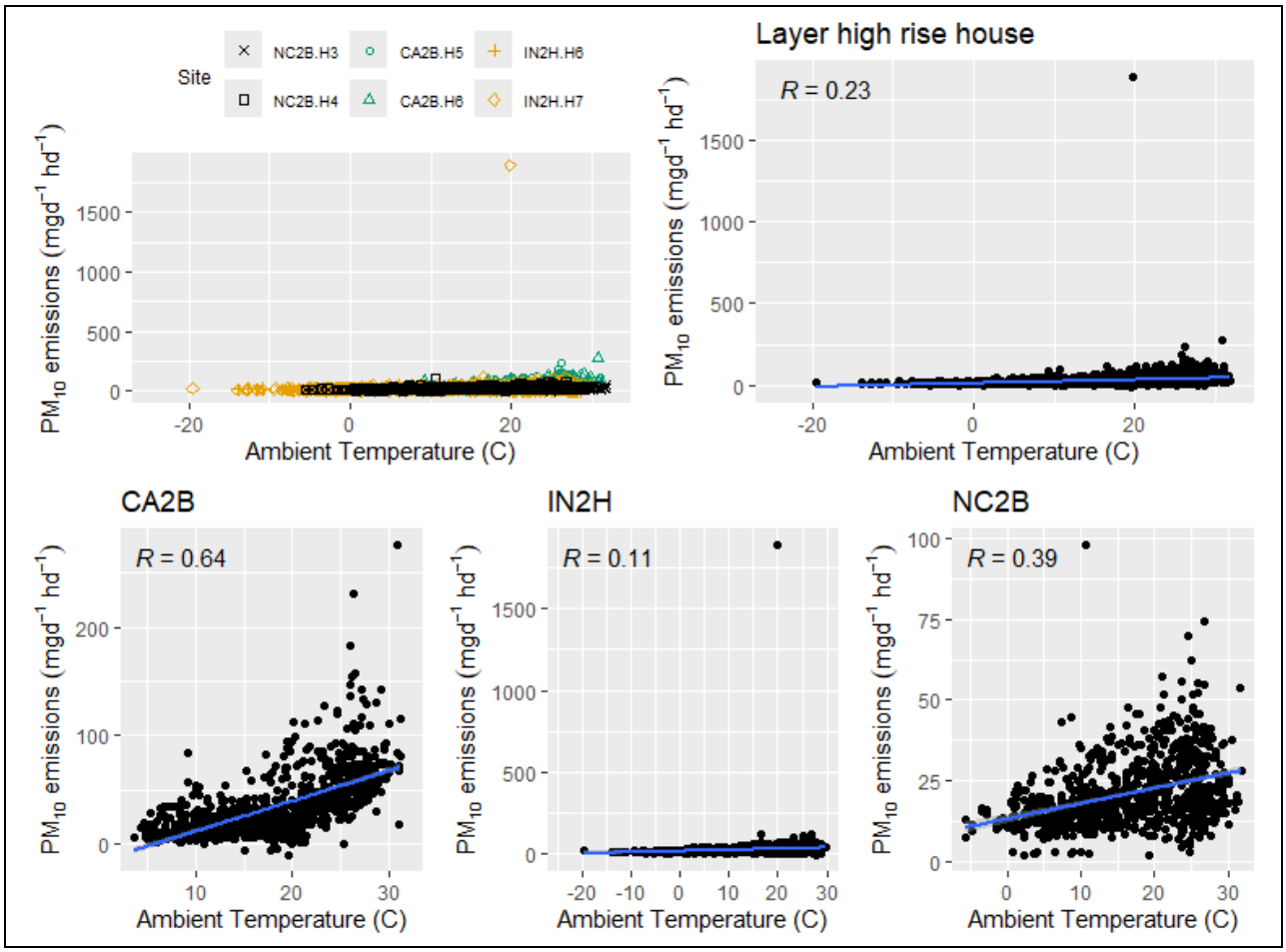

Figure 1.70: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

1.2.3.2 Ambient relative humidity

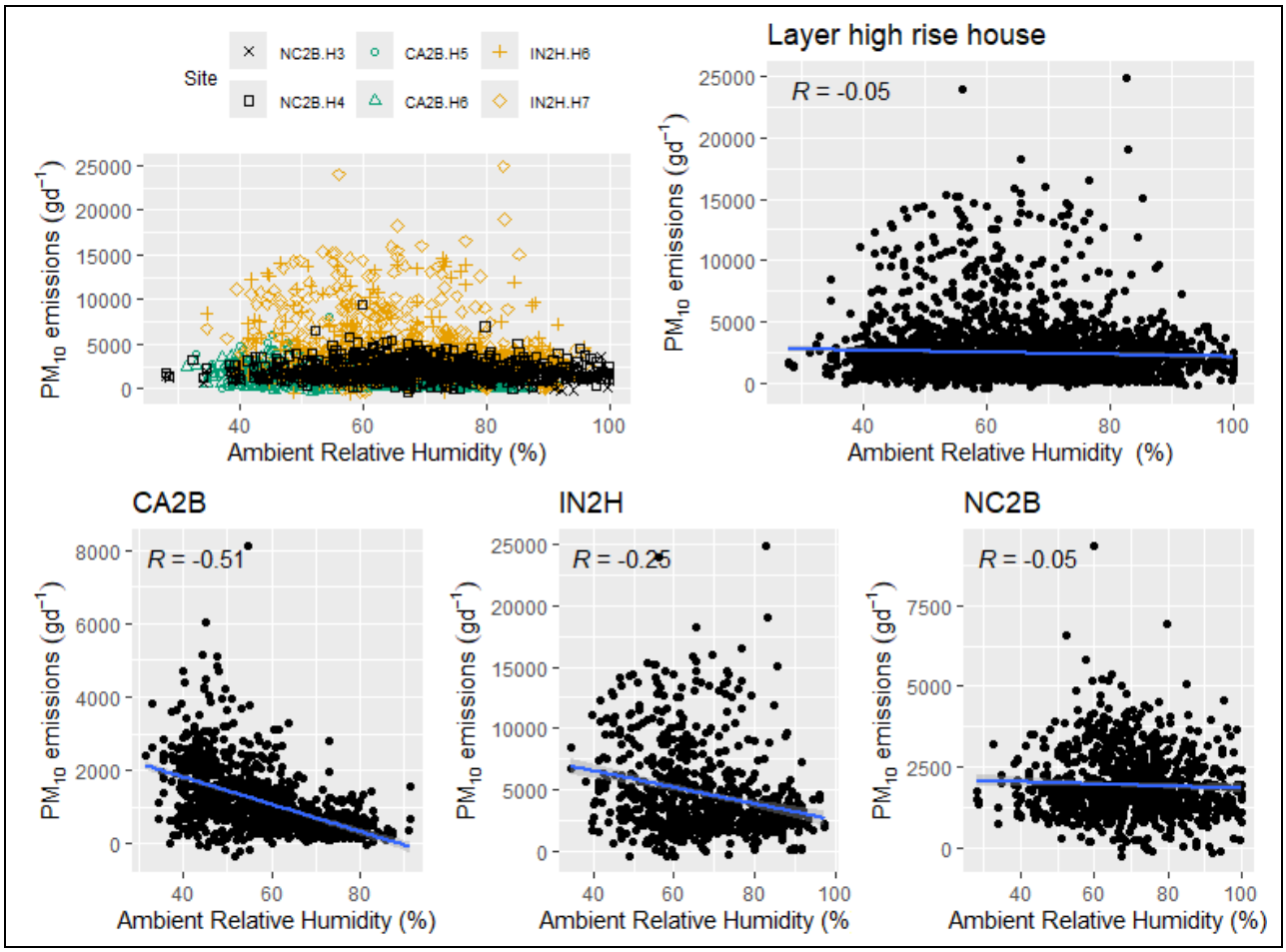

Figure 1.71: Scatter plot of layer high rise house PM_{10} emissions (g d^{-1}) versus ambient relative humidity.

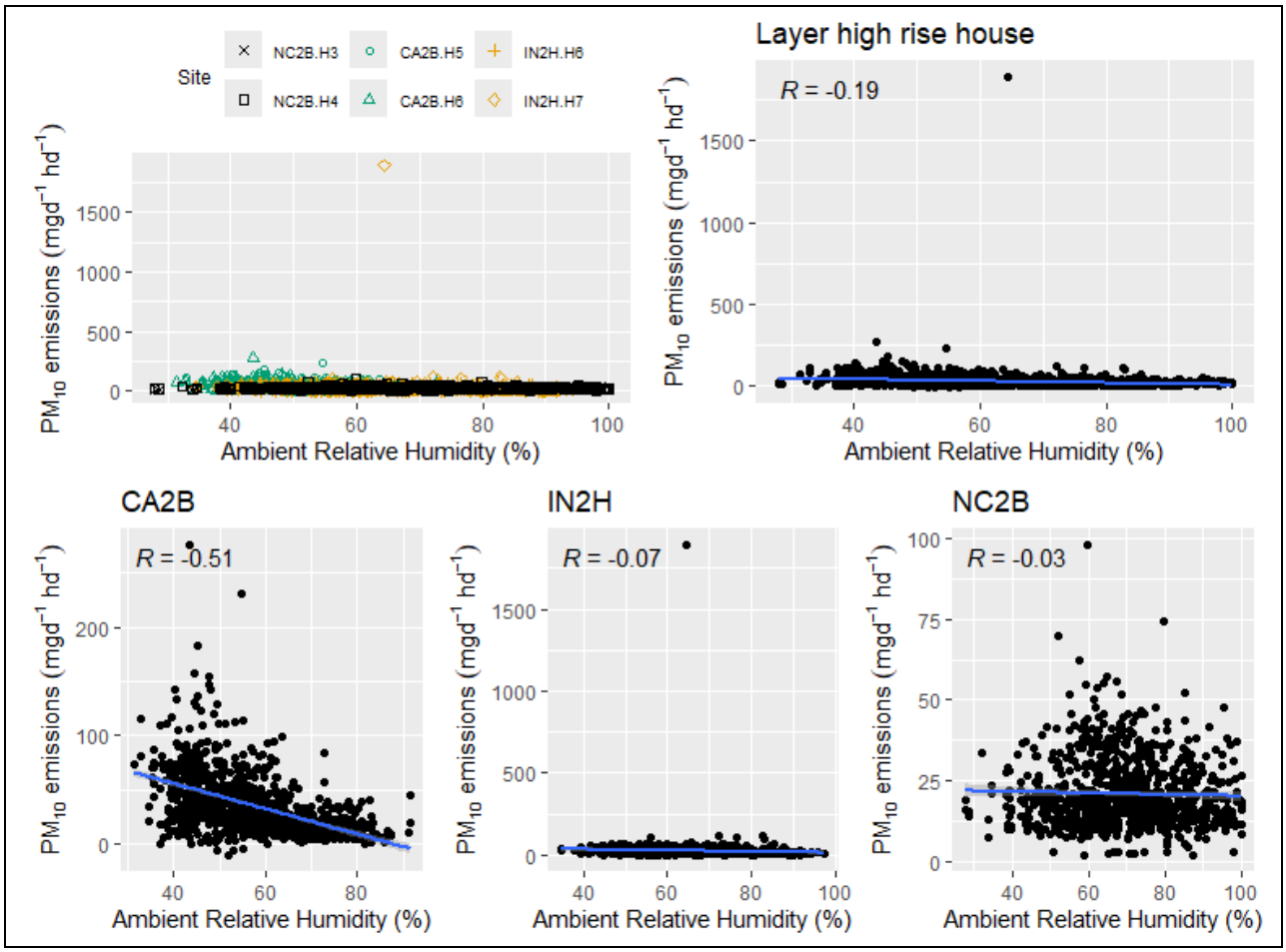

Figure 1.72: Scatter plot of layer high rise house PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

1.2.4 Particulate Matter ($PM_{2.5}$)

1.2.4.1 Ambient temperature

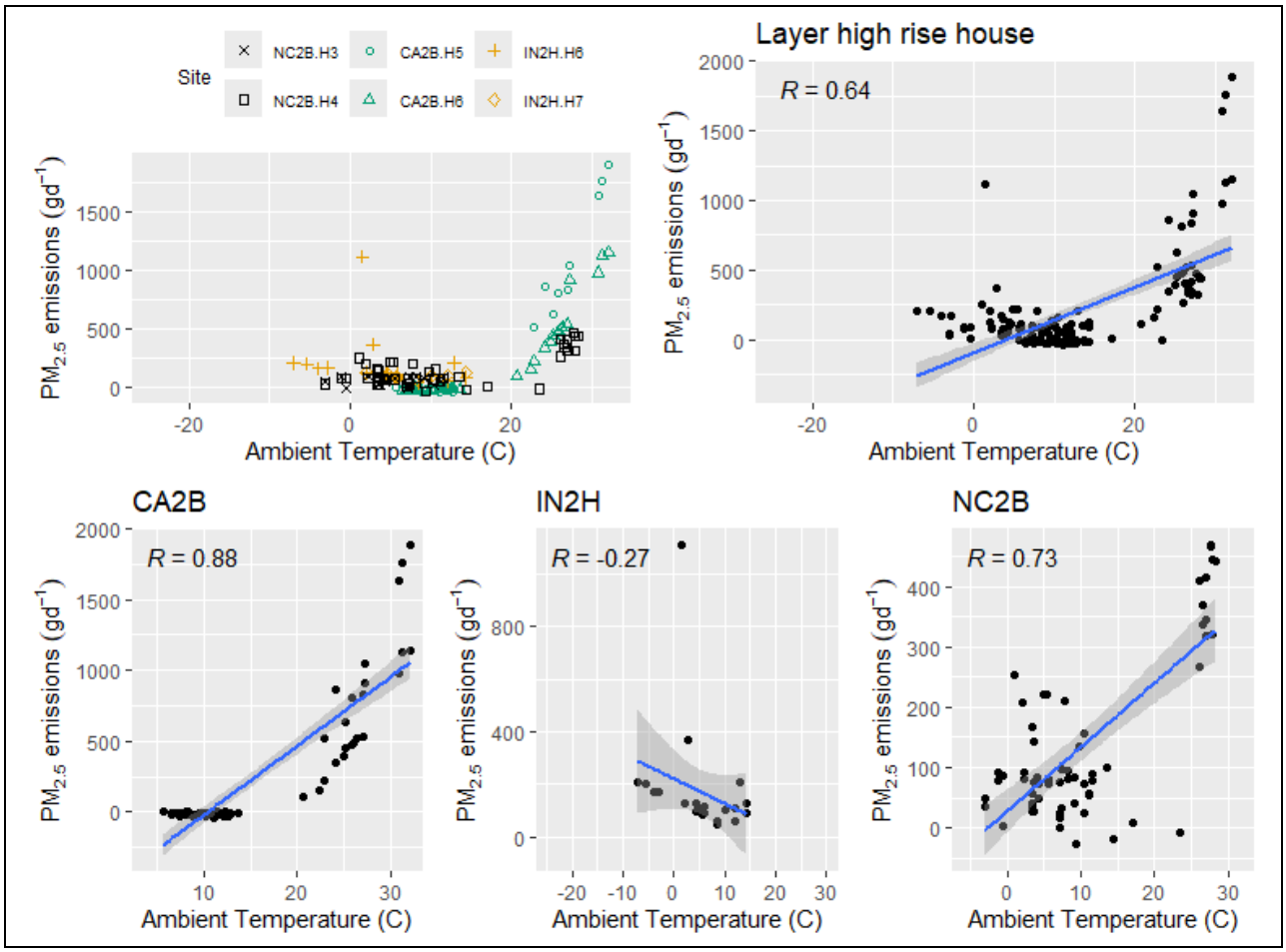

Figure 1.73: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus ambient temperature.

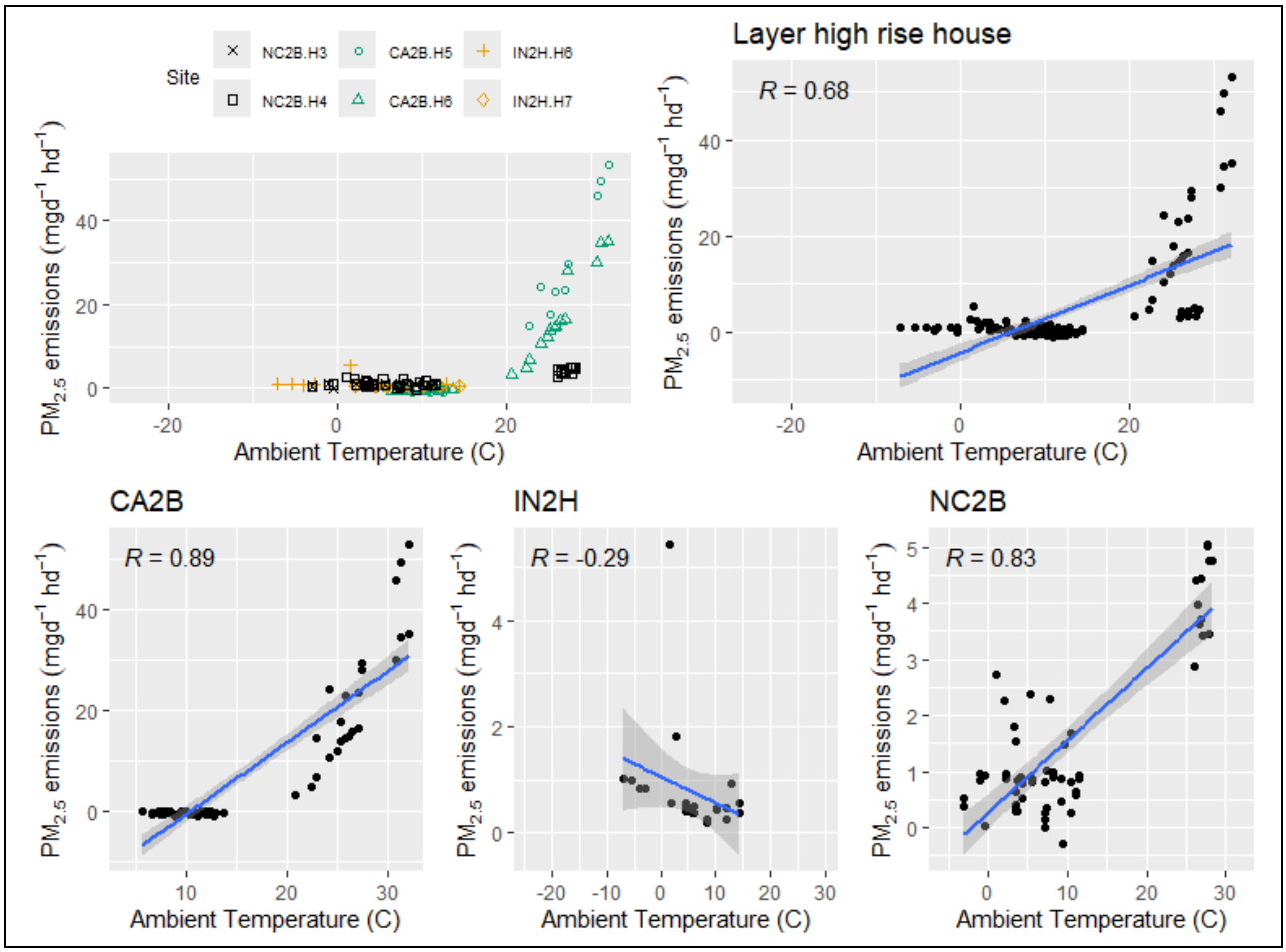

Figure 1.74: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

1.2.4.2 Ambient relative humidity

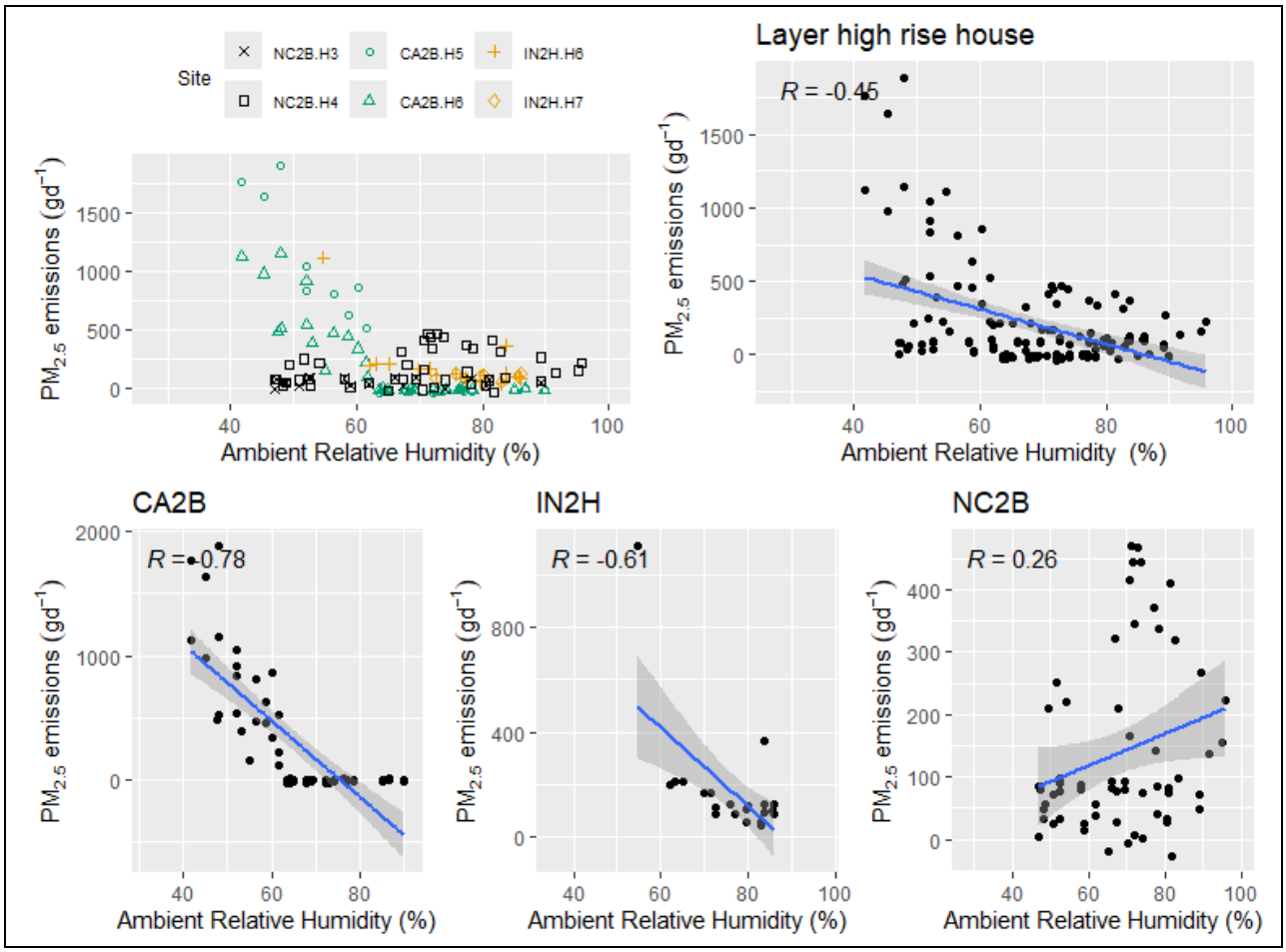

Figure 1.75: Scatter plot of layer high rise house $PM_{2.5}$ emissions (g d^{-1}) versus ambient relative humidity.

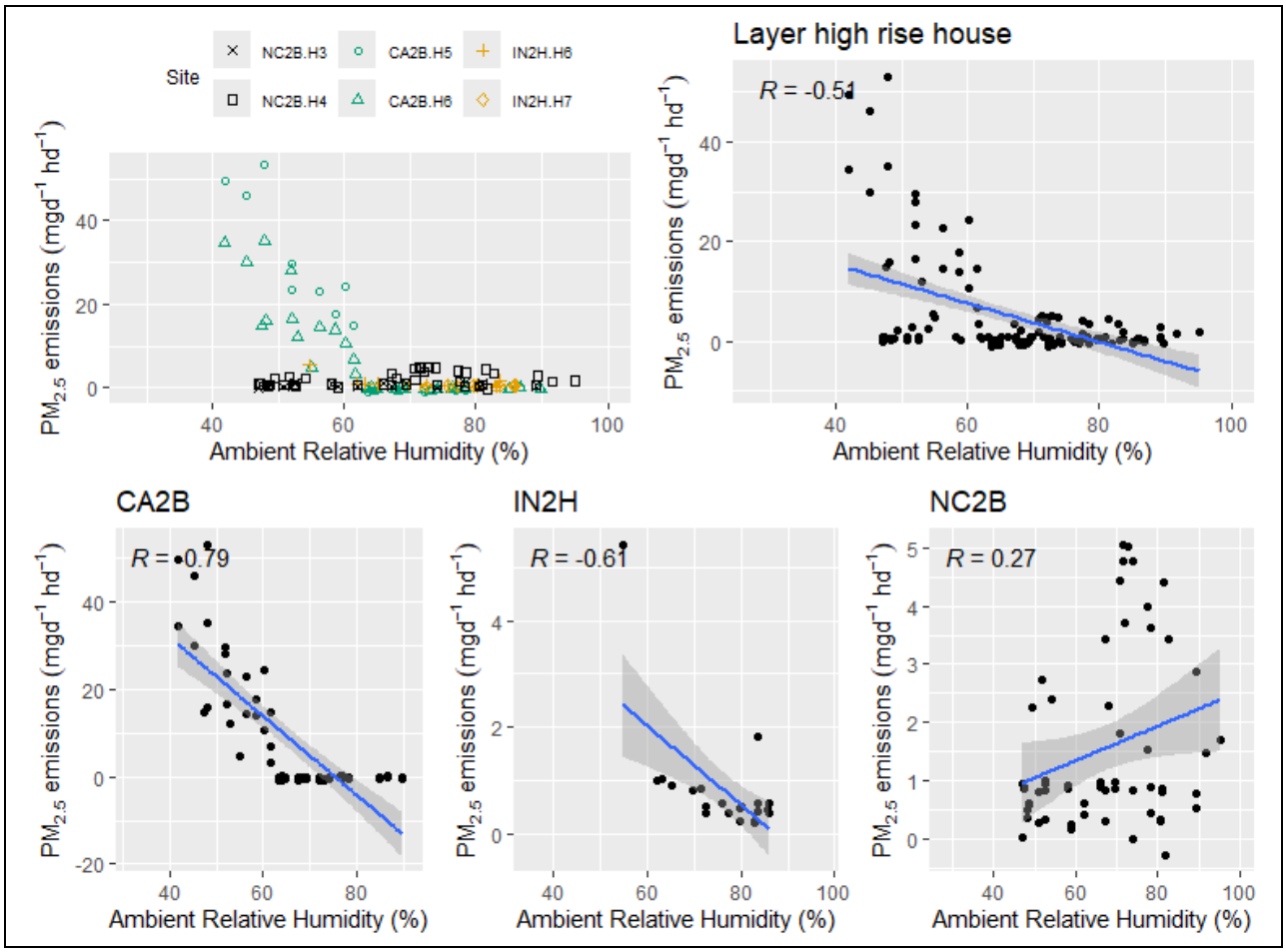

Figure 1.76: Scatter plot of layer high rise house $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

1.2.5 Total Suspended Particulates (TSP

1.2.5.1 Ambient temperature

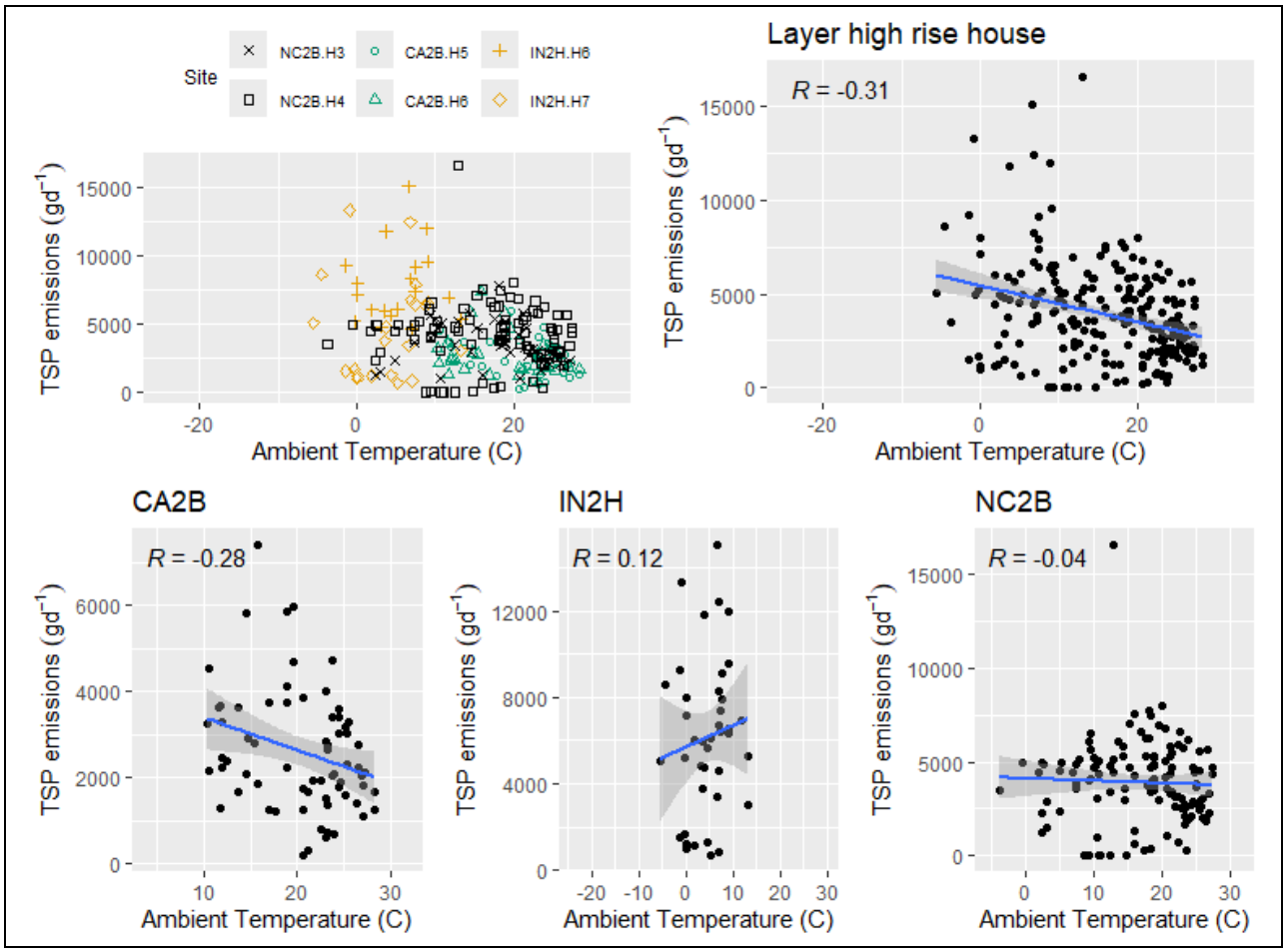

Figure 1.77: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus ambient temperature.

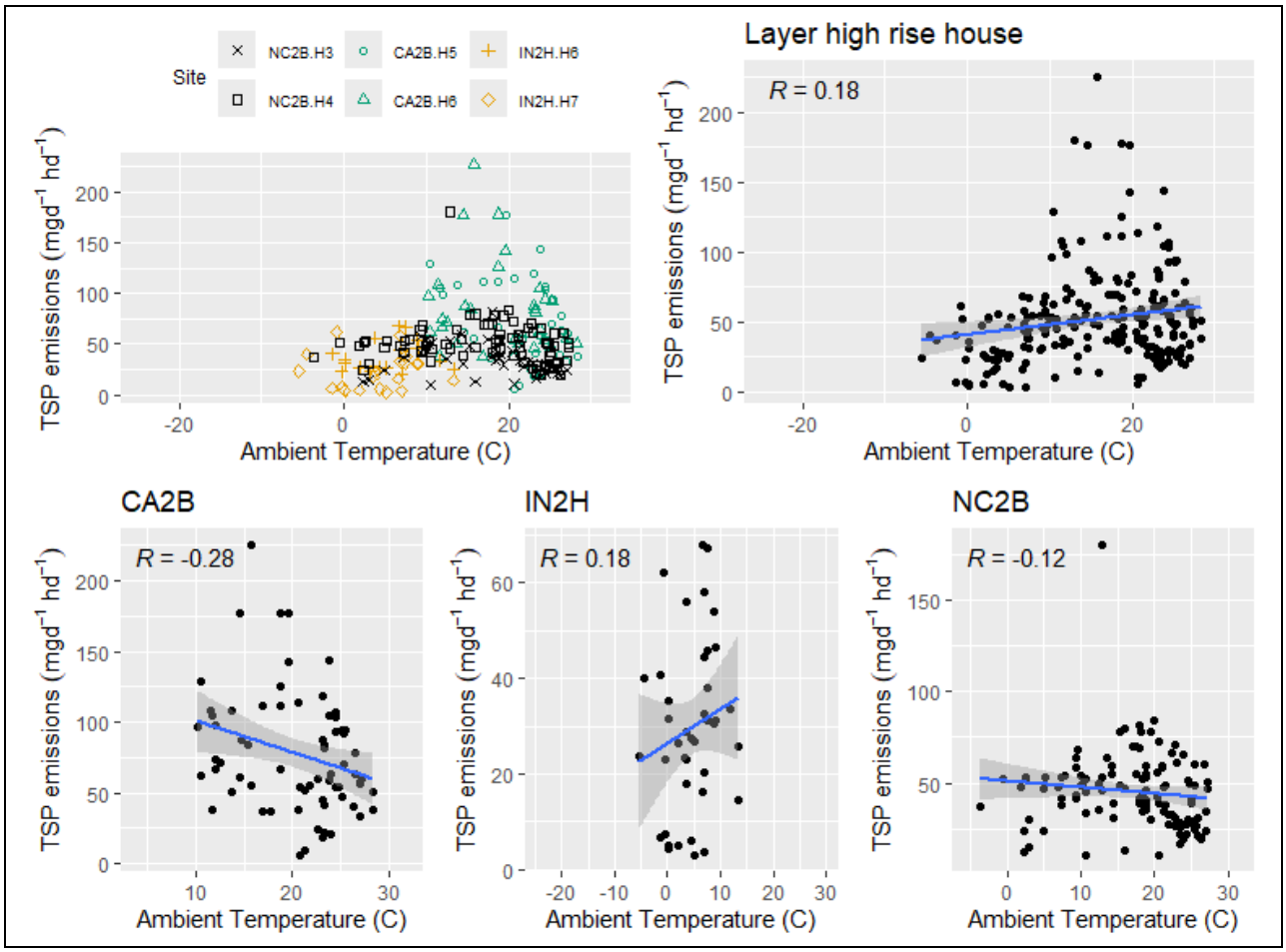

Figure 1.78: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

1.2.5.2 Ambient relative humidity

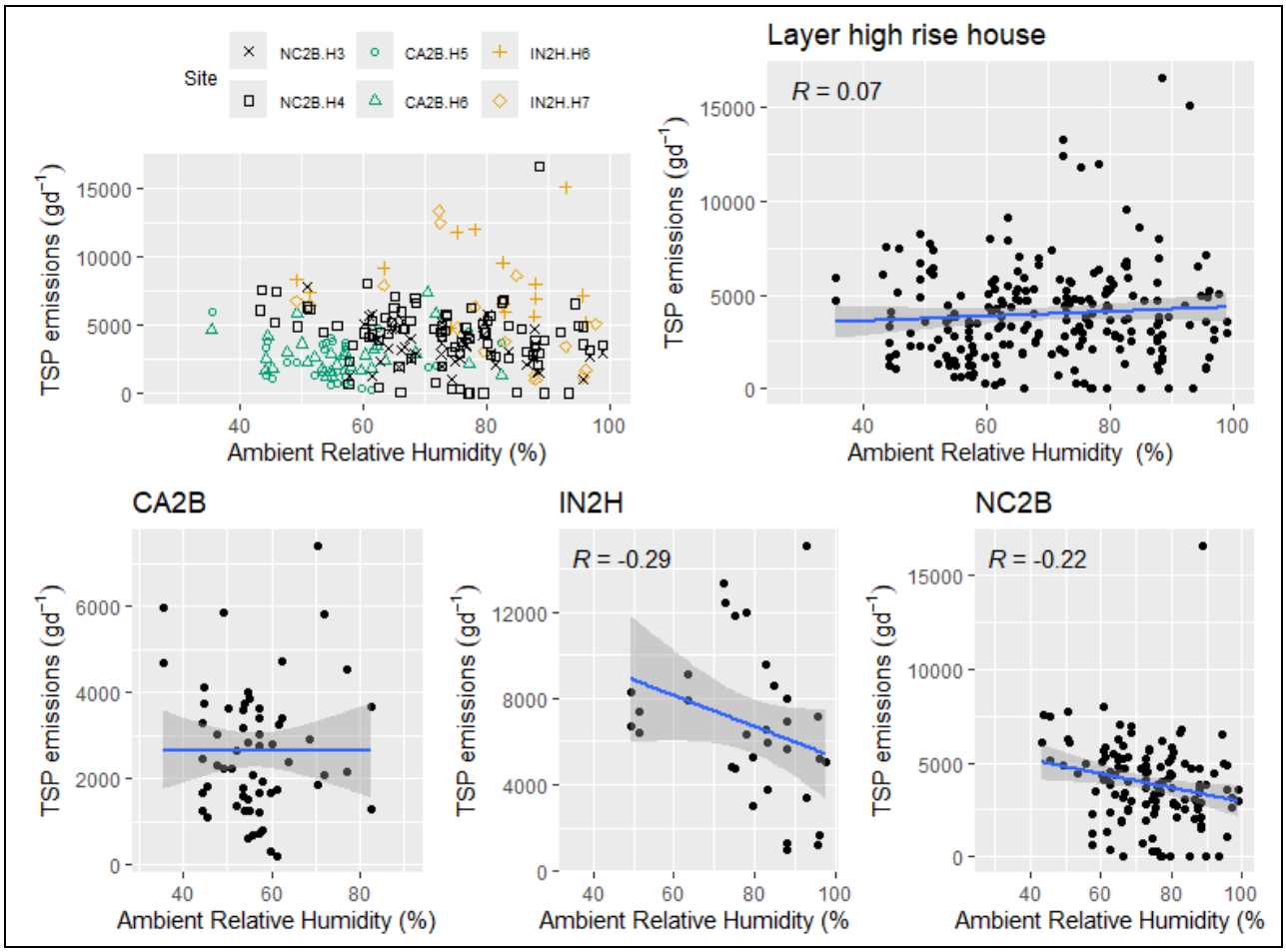

Figure 1.79: Scatter plot of layer high rise house TSP emissions (g d^{-1}) versus ambient relative humidity.

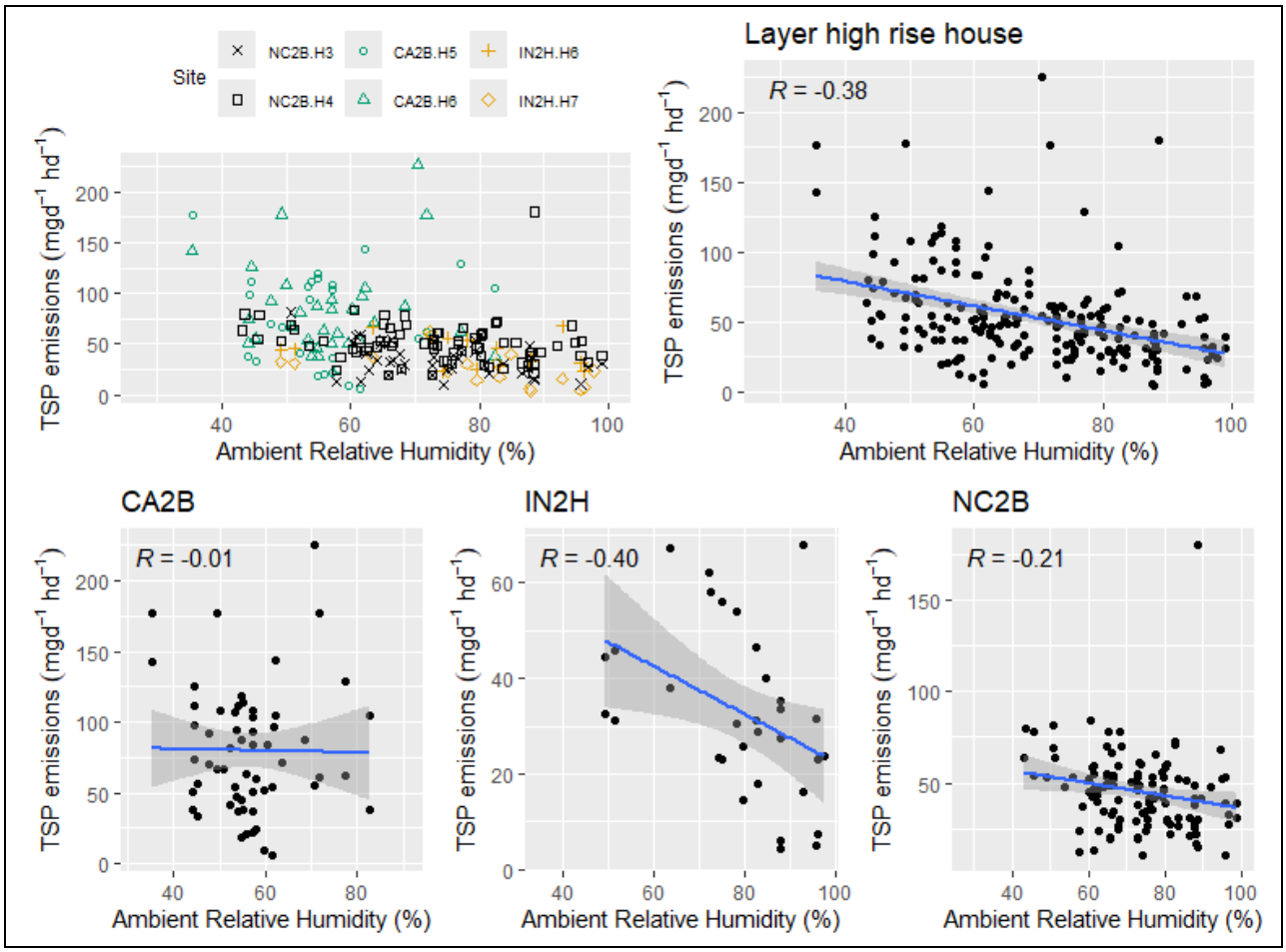

Figure 1.80: Scatter plot of layer high rise house TSP emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

2 Belted Houses

2.1 Environmental

Table 2.1: Summary of layer manure belt houses R^{-2} values for environmental parameters.

Emissions	Parameter	R	R2	Strength
NH_3 (kgd^{-1})	Inventory (hd)	0.23	0.05	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Inventory (hd)	-0.21	0.04	slight or weak
NH_3 (kgd^{-1})	Average weight (kg)	0.21	0.05	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Average weight (kg)	0.22	0.05	slight or weak
NH_3 (kgd^{-1})	Live animal weight (kg)	0.27	0.07	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Live animal weight (kg)	0.26	0.07	slight or weak
NH_3 (kgd^{-1})	Exhaust Temperature (C)	0.01	0	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Exhaust Temperature (C)	-0.13	0.02	slight or weak
NH_3 (kgd^{-1})	Exhaust Relative humidity (%)	0.38	0.15	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	0.29	0.08	slight or weak
NH_3 (kgd^{-1})	Airflow (dsm^3s^{-1})	-0.09	0.01	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	-0.04	0	slight or weak
H_2S (gd^{-1})	Inventory (hd)	0.29	0.09	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Inventory (hd)	0.37	0.14	slight or weak
H_2S (gd^{-1})	Average weight (kg)	0.13	0.02	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Average weight (kg)	0.14	0.02	slight or weak
H_2S (gd^{-1})	Live animal weight (kg)	0.28	0.08	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	0.26	0.07	slight or weak
H_2S (gd^{-1})	Exhaust Temperature (C)	0.27	0.07	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	0.29	0.08	slight or weak
H_2S (gd^{-1})	Exhaust Relative humidity (%)	0.2	0.04	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	0.22	0.05	slight or weak
H_2S (gd^{-1})	Airflow (dsm^3s^{-1})	0.21	0.05	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	0.17	0.03	slight or weak
PM_{10} (gd^{-1})	Inventory (hd)	0.14	0.02	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Inventory (hd)	0.09	0.01	slight or weak
PM_{10} (gd^{-1})	Average weight (kg)	0.04	0	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Average weight (kg)	0.04	0	slight or weak
PM_{10} (gd^{-1})	Live animal weight (kg)	0.16	0.02	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	0.15	0.02	slight or weak
PM_{10} (gd^{-1})	Exhaust Temperature (C)	-0.02	0	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	-0.03	0	slight or weak
PM_{10} (gd^{-1})	Exhaust Relative humidity (%)	-0.09	0.01	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	-0.09	0.01	slight or weak
PM_{10} (gd^{-1})	Airflow (dsm^3s^{-1})	0.16	0.03	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	0.16	0.03	slight or weak
$PM_{2.5}$ (gd^{-1})	Inventory (hd)	0.35	0.12	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Inventory (hd)	0.35	0.12	slight or weak
$PM_{2.5}$ (gd^{-1})	Average weight (kg)	-0.35	0.12	slight or weak

Emissions	Parameter	R	R2	Strength
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Average weight (kg)	-0.35	0.13	slight or weak
$PM_{2.5}$ (gd^{-1})	Live animal weight (kg)	-0.28	0.08	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	-0.28	0.08	slight or weak
$PM_{2.5}$ (gd^{-1})	Exhaust Temperature (C)	-0.29	0.09	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	-0.29	0.08	slight or weak
$PM_{2.5}$ (gd^{-1})	Exhaust Relative humidity (%)	-0.29	0.08	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	-0.29	0.08	slight or weak
$PM_{2.5}$ (gd^{-1})	Airflow (dsm^3s^{-1})	-0.24	0.06	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	-0.23	0.05	slight or weak
TSP (gd^{-1})	Inventory (hd)	-0.04	0	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Inventory (hd)	-0.05	0	slight or weak
TSP (gd^{-1})	Average weight (kg)	-0.09	0.01	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Average weight (kg)	-0.09	0.01	slight or weak
TSP (gd^{-1})	Live animal weight (kg)	-0.1	0.01	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	-0.1	0.01	slight or weak
TSP (gd^{-1})	Exhaust Temperature (C)	0.14	0.02	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Exhaust Temperature (C)	0.15	0.02	slight or weak
TSP (gd^{-1})	Exhaust Relative humidity (%)	0.17	0.03	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Exhaust Relative humidity (%)	0.17	0.03	slight or weak
TSP (gd^{-1})	Airflow (dsm^3s^{-1})	0.39	0.15	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Airflow (dsm^3s^{-1})	0.4	0.16	slight or weak

2.1.1 Ammonia (NH_3)

2.1.1.1 Inventory

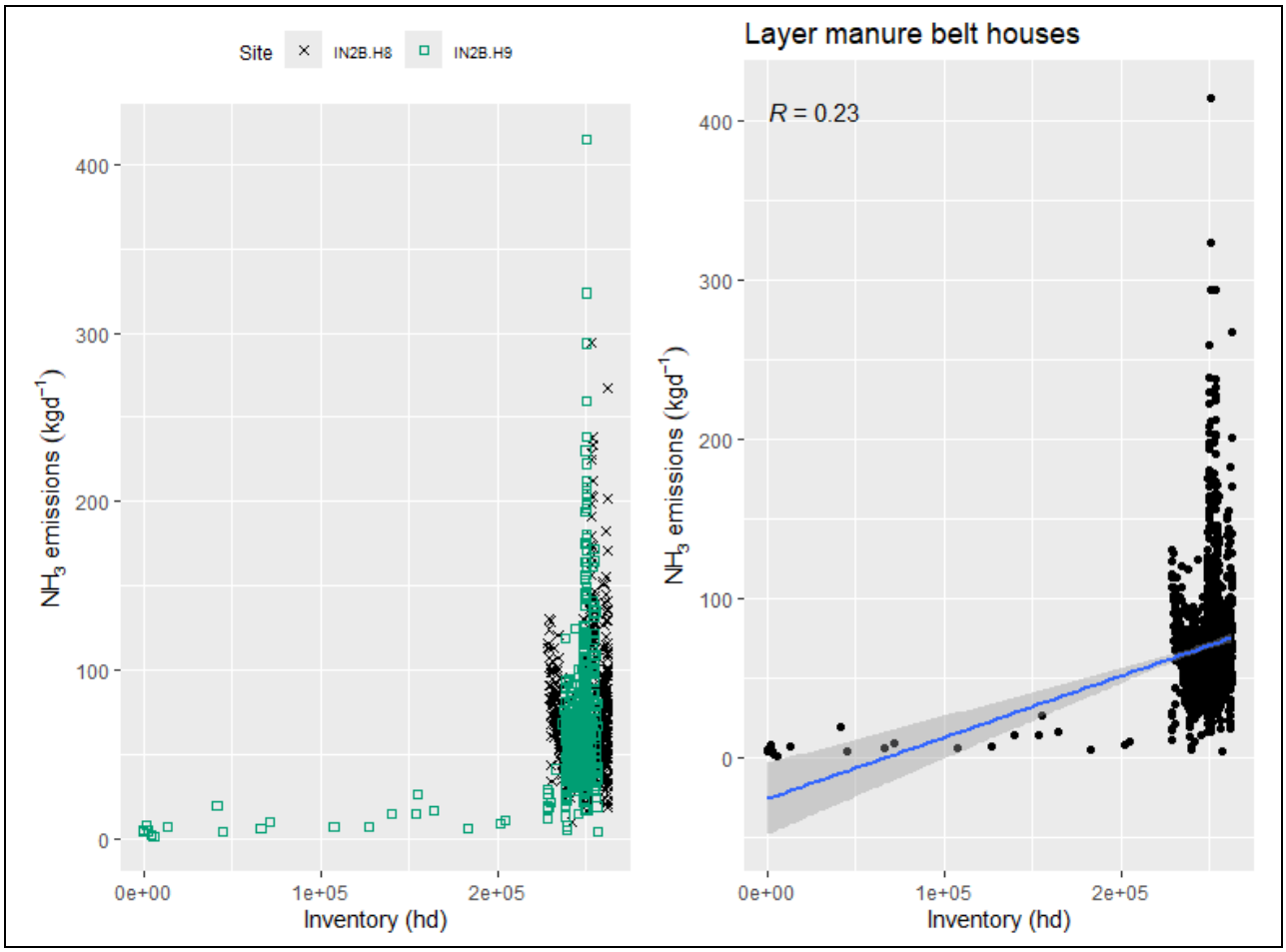

Figure 2.1: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus Inventory.

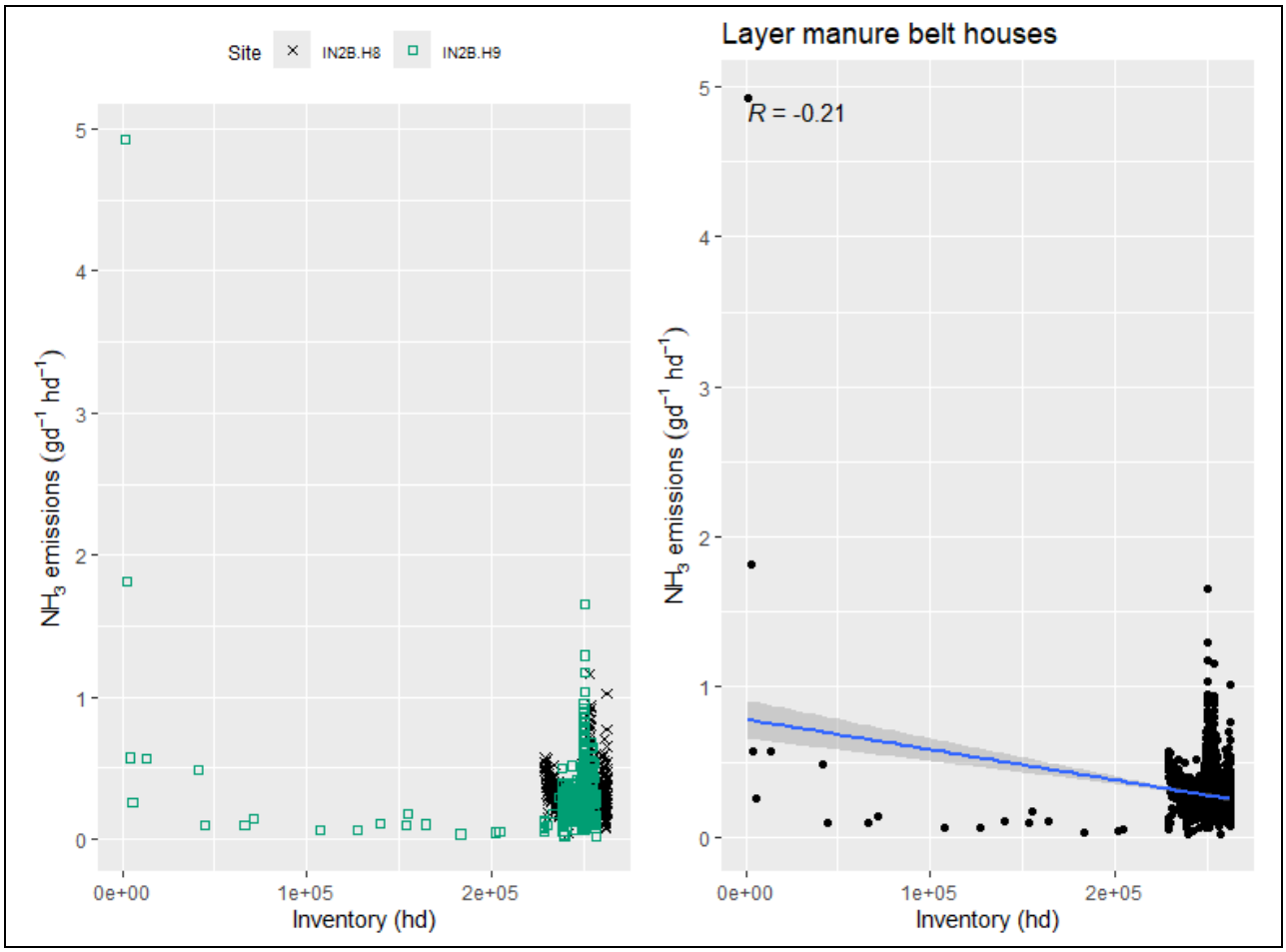

Figure 2.2: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus Inventory.

2.1.1.2 Average animal weight

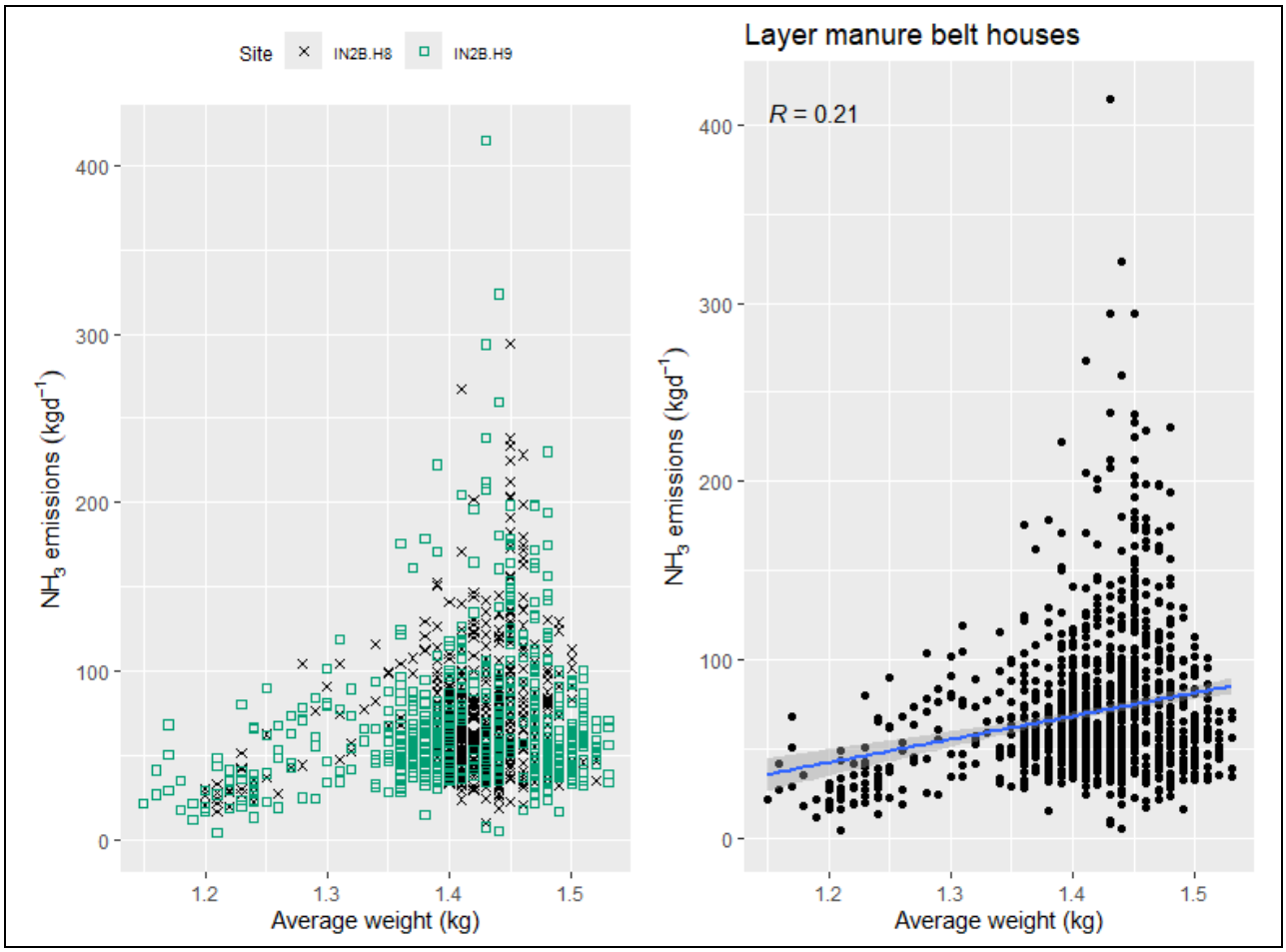

Figure 2.3: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus average animal weight.

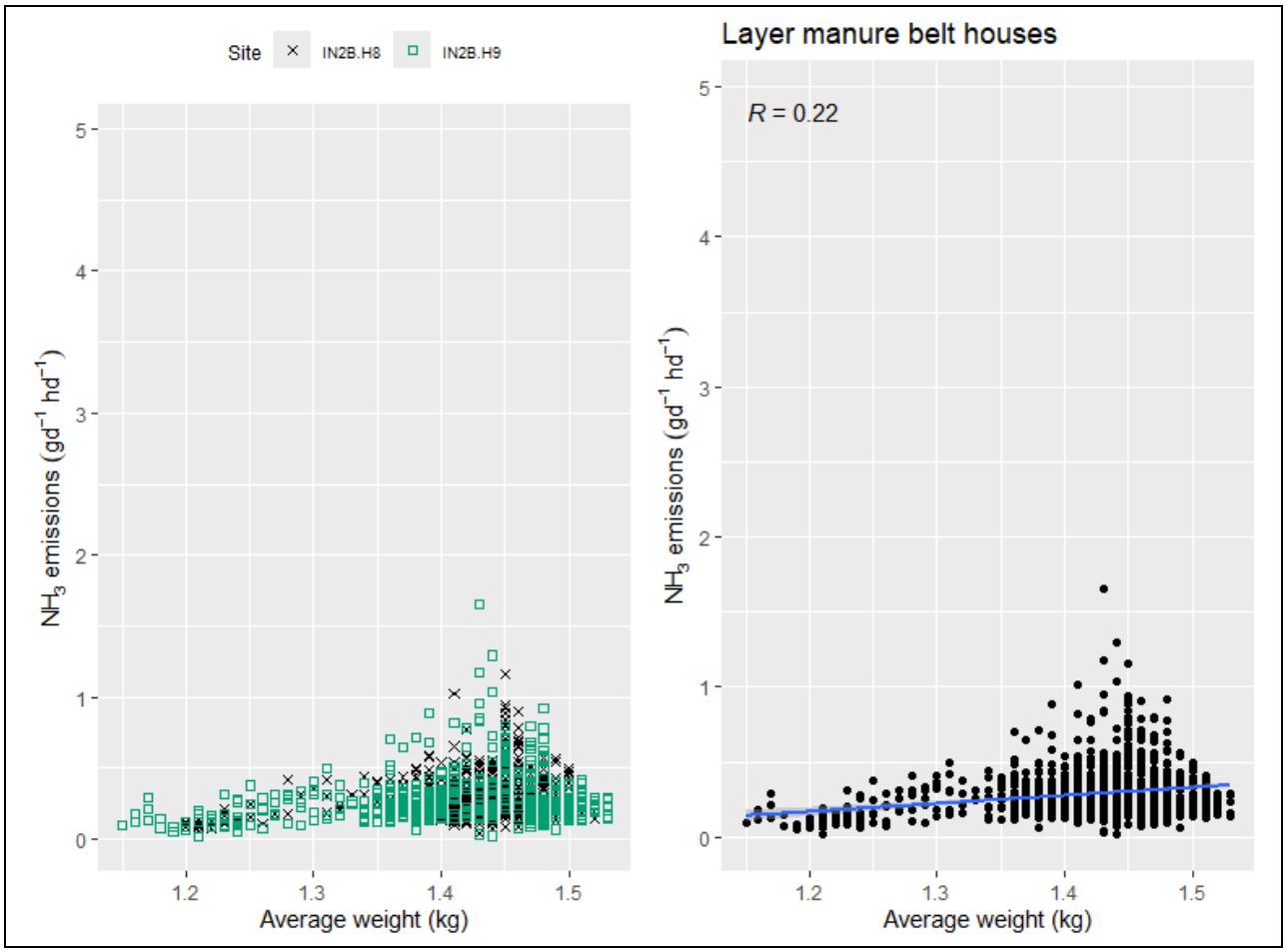

Figure 2.4: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus average animal weight.

2.1.1.3 Live animal weight

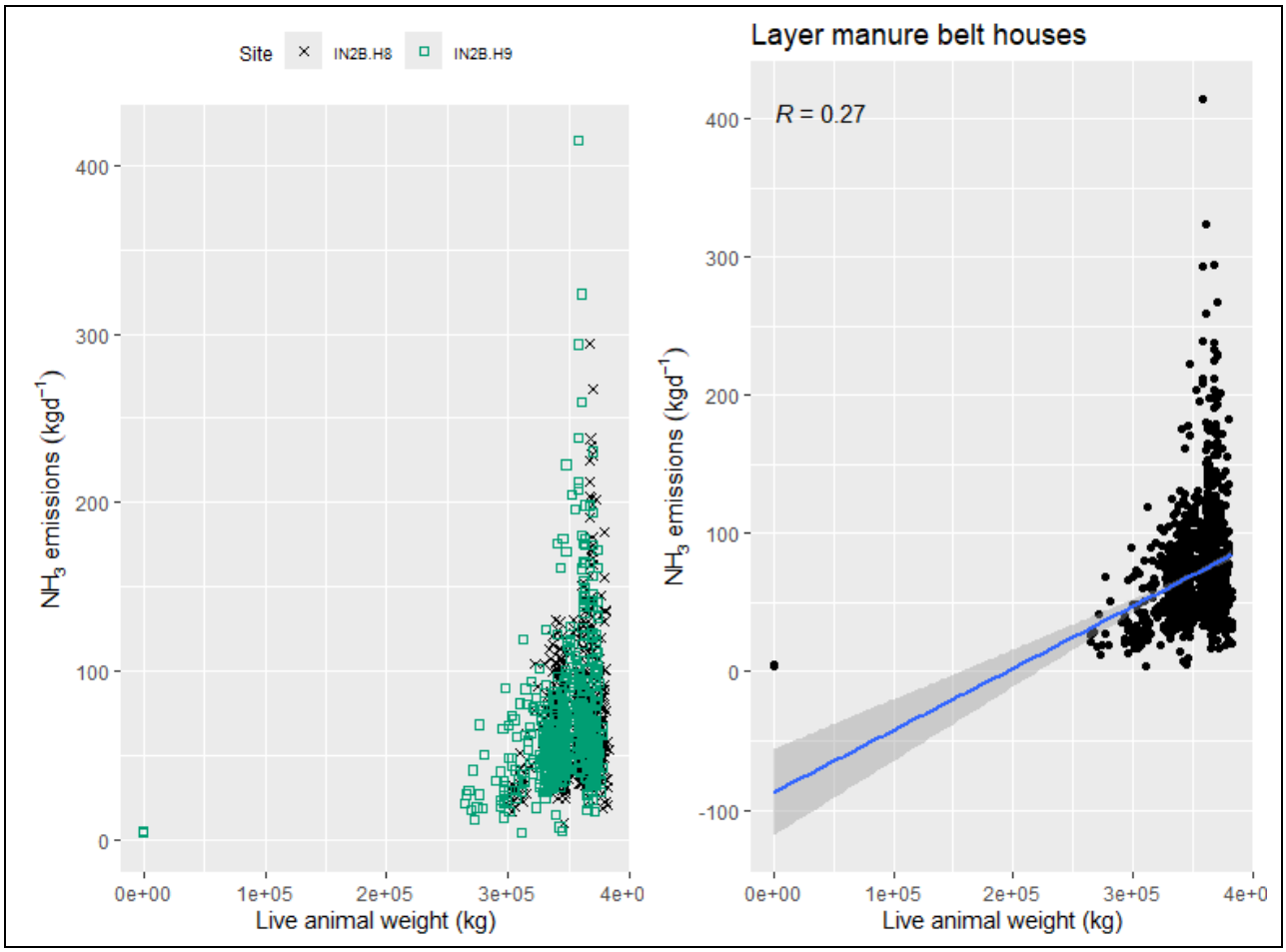

Figure 2.5: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus live animal weight.

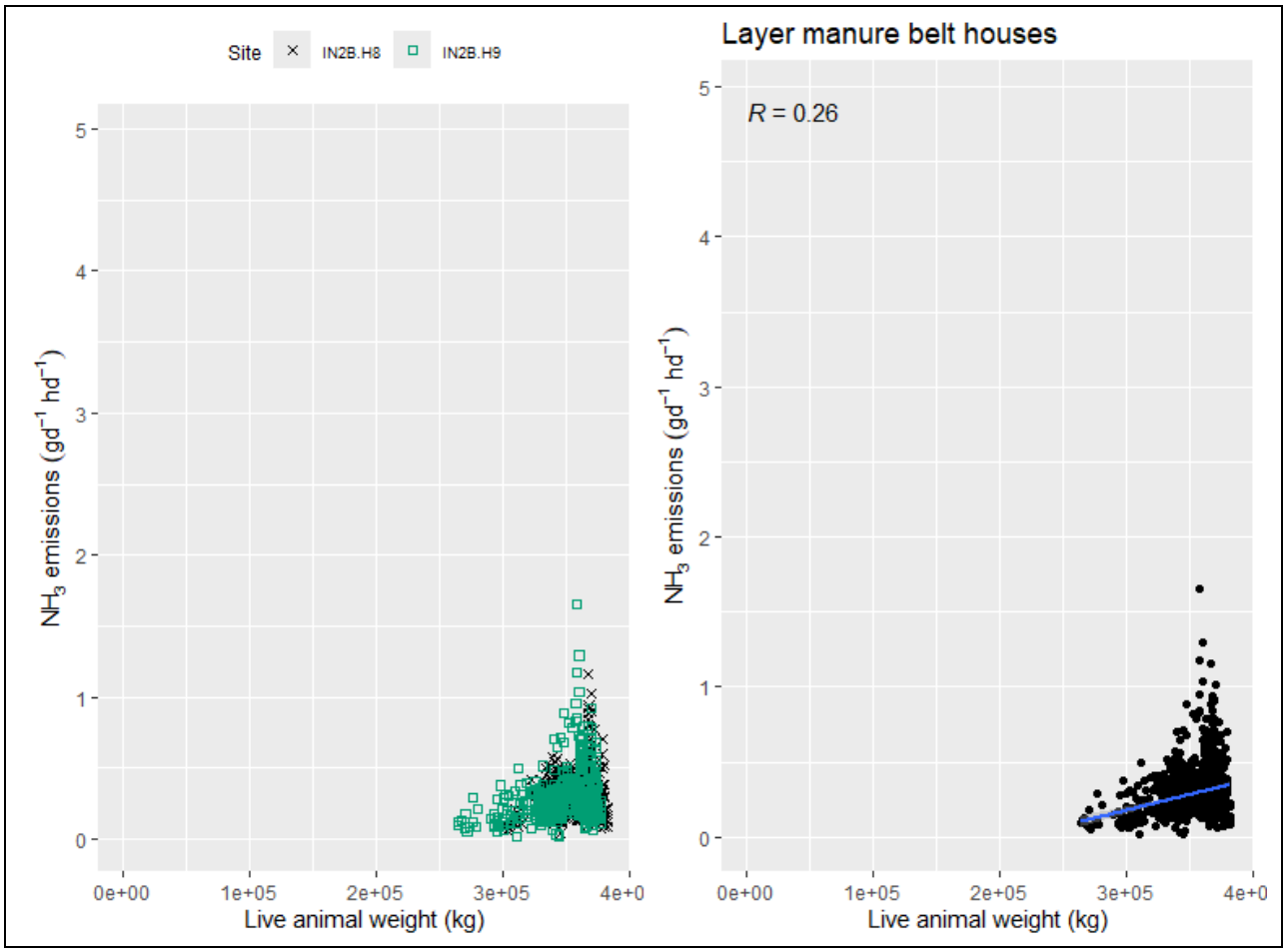

Figure 2.6: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus live animal weight.

2.1.1.4 Exhaust temperature

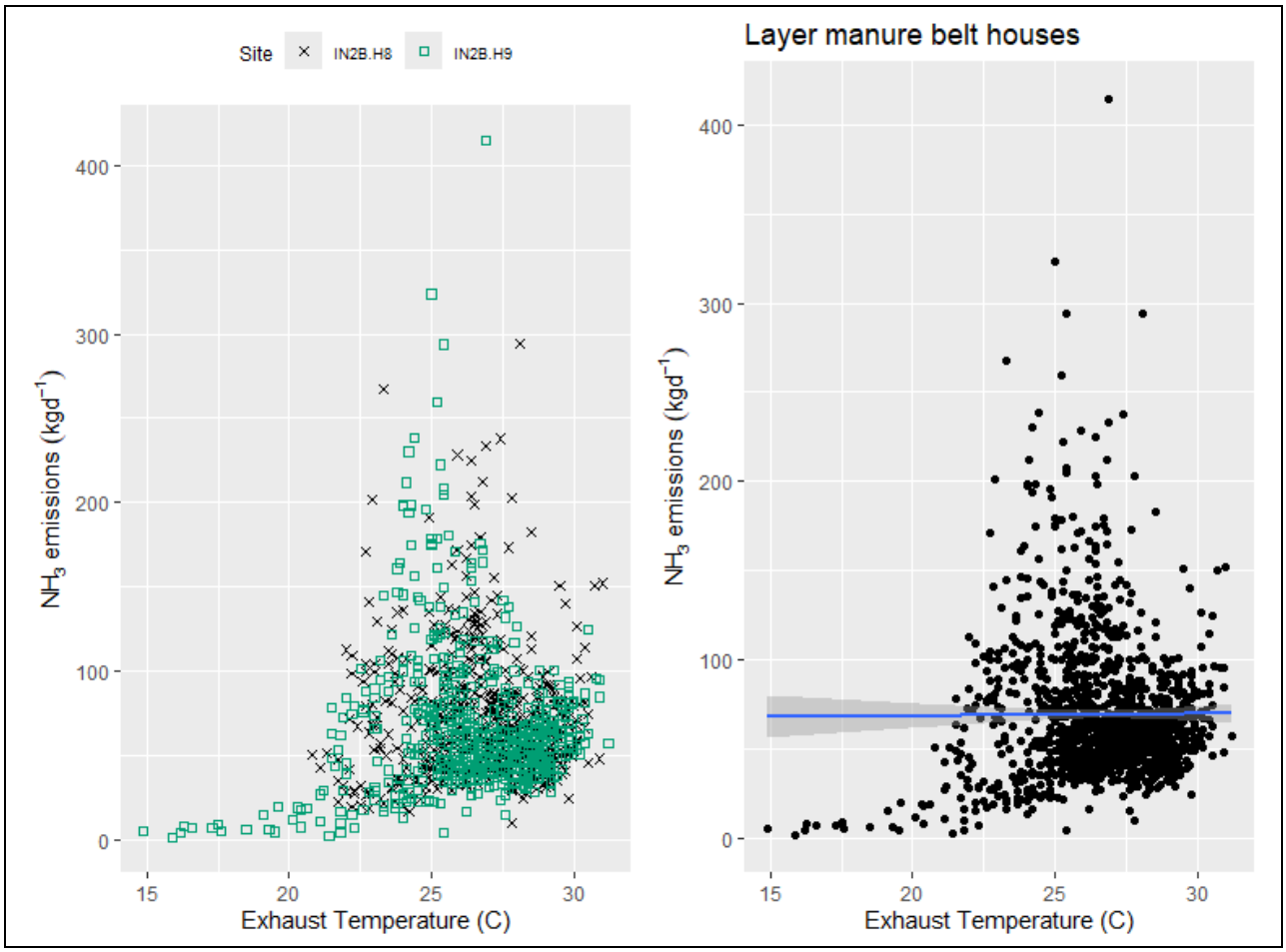

Figure 2.7: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus exhaust temperature.

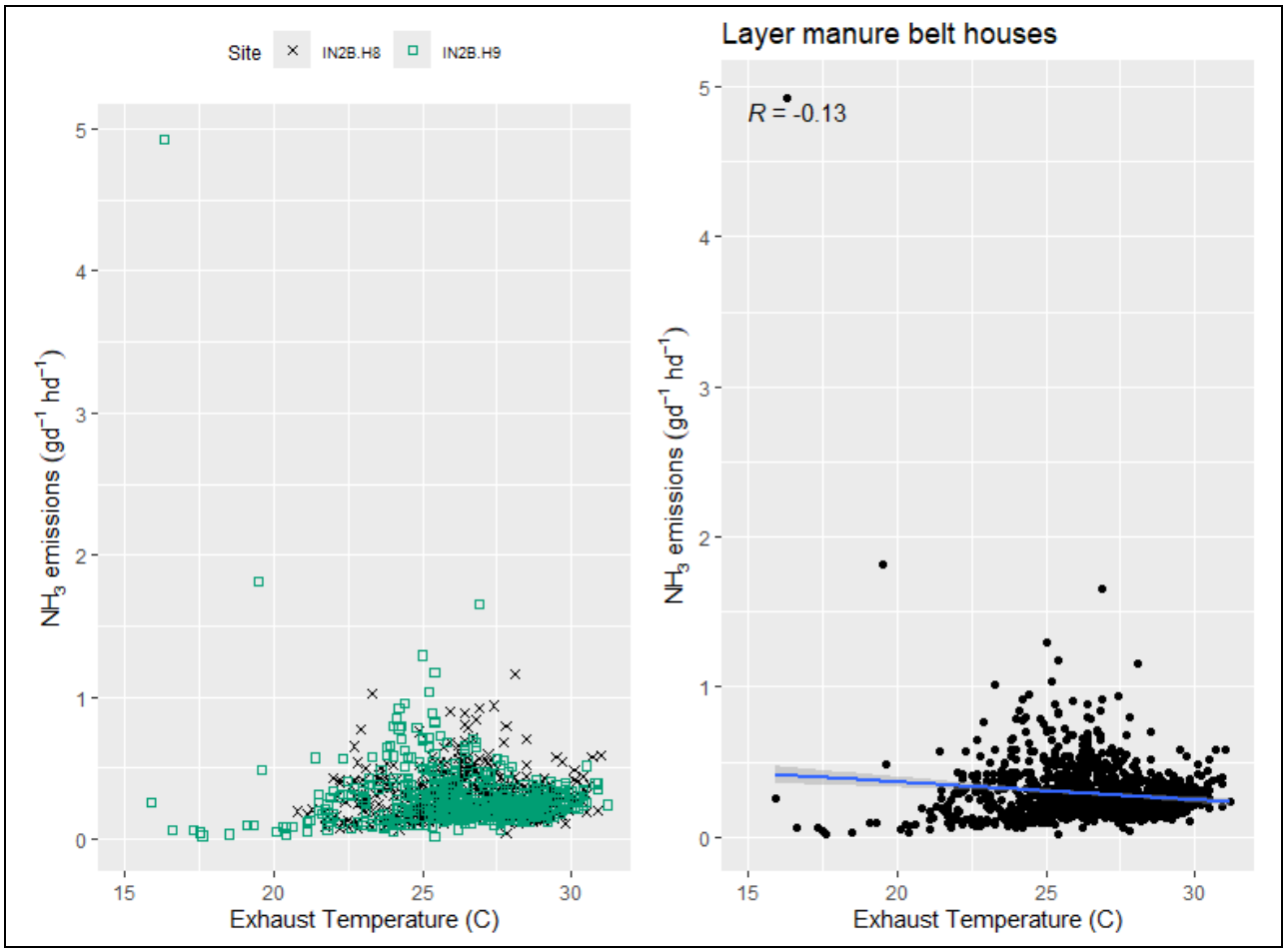

Figure 2.8: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus exhaust temperature.

2.1.1.5 *Exhaust relative humidity*

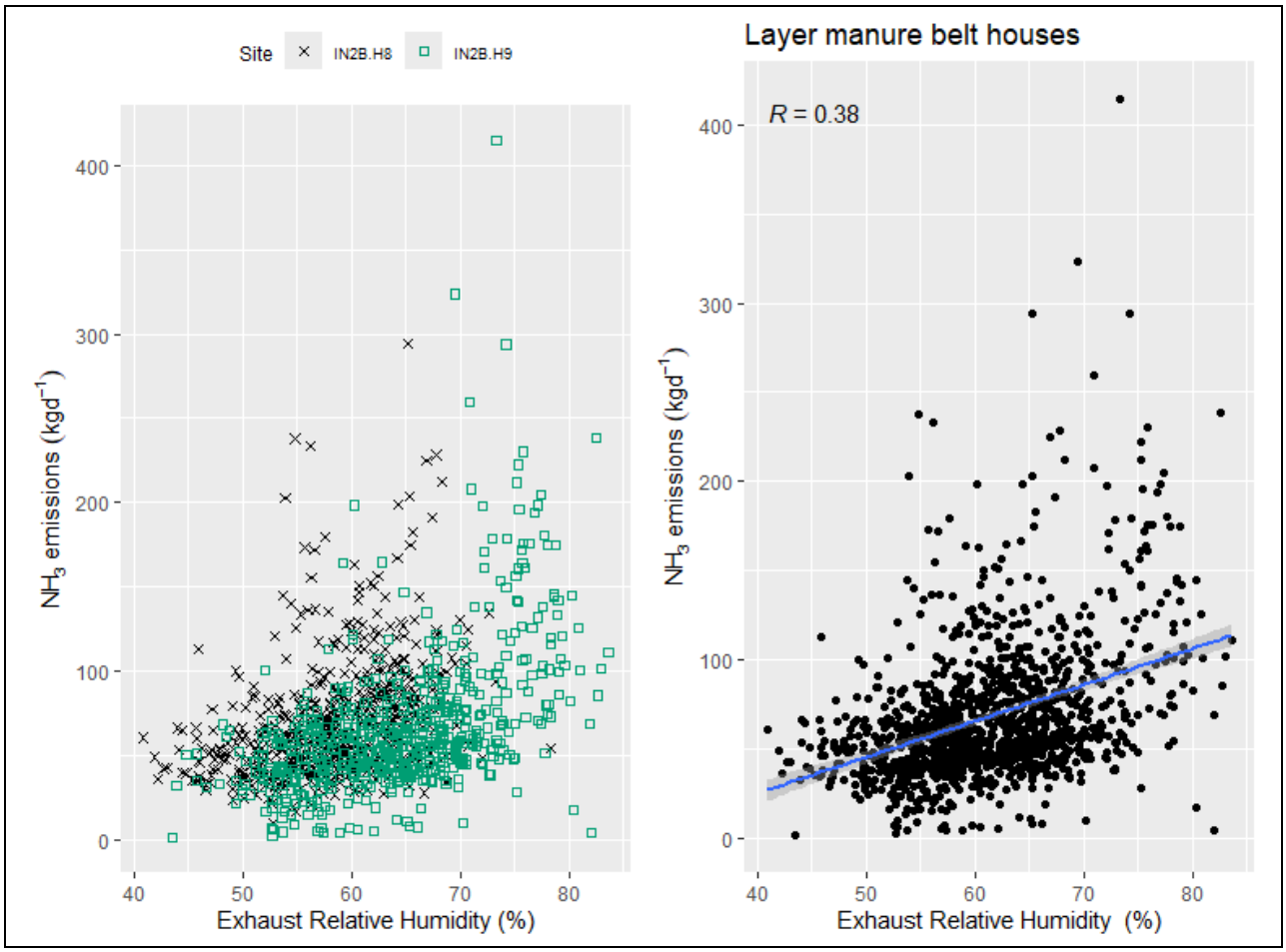

Figure 2.9: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus exhaust relative humidity.

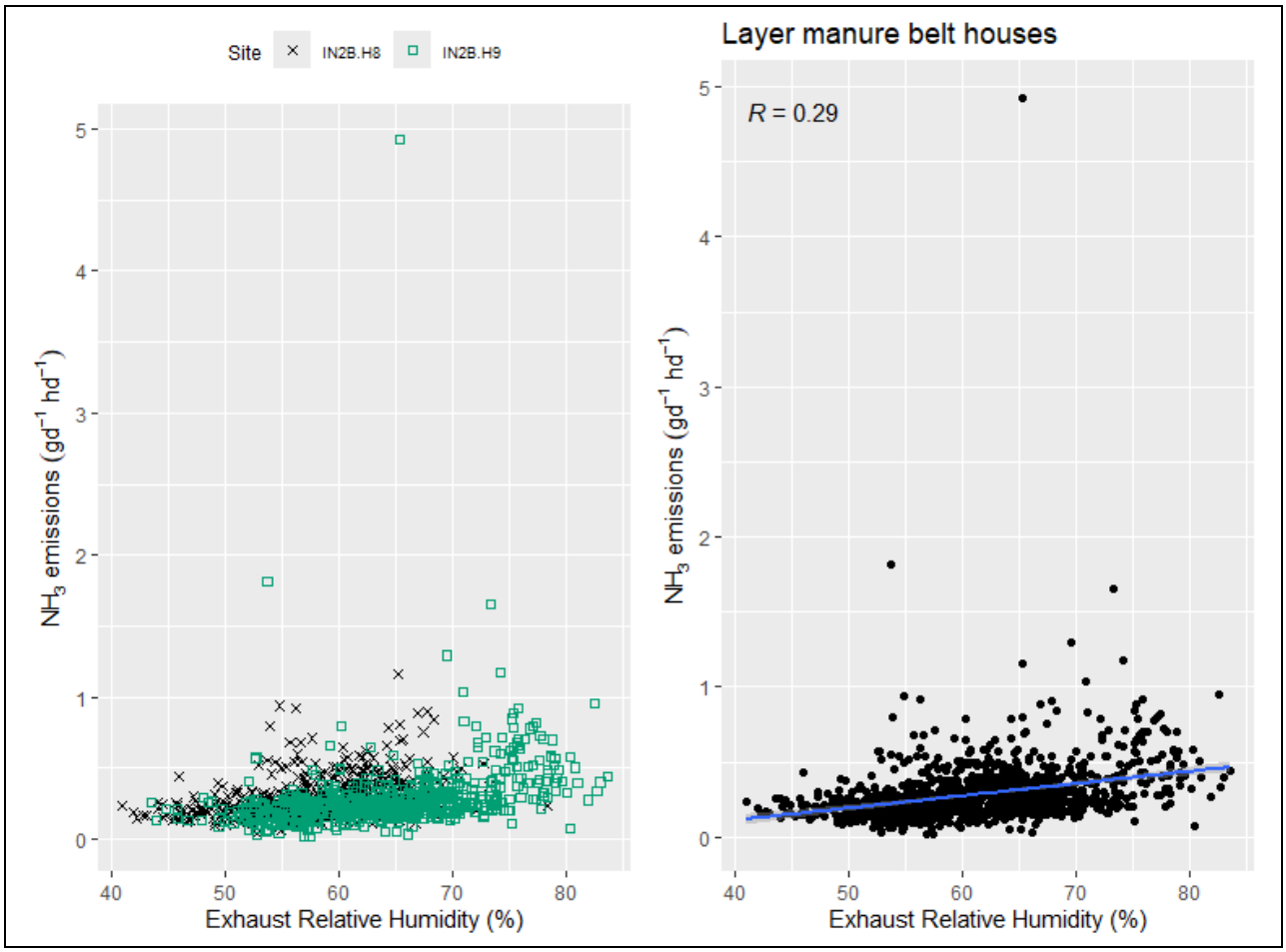

Figure 2.10: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus exhaust relative humidity.

2.1.1.6 Airflow

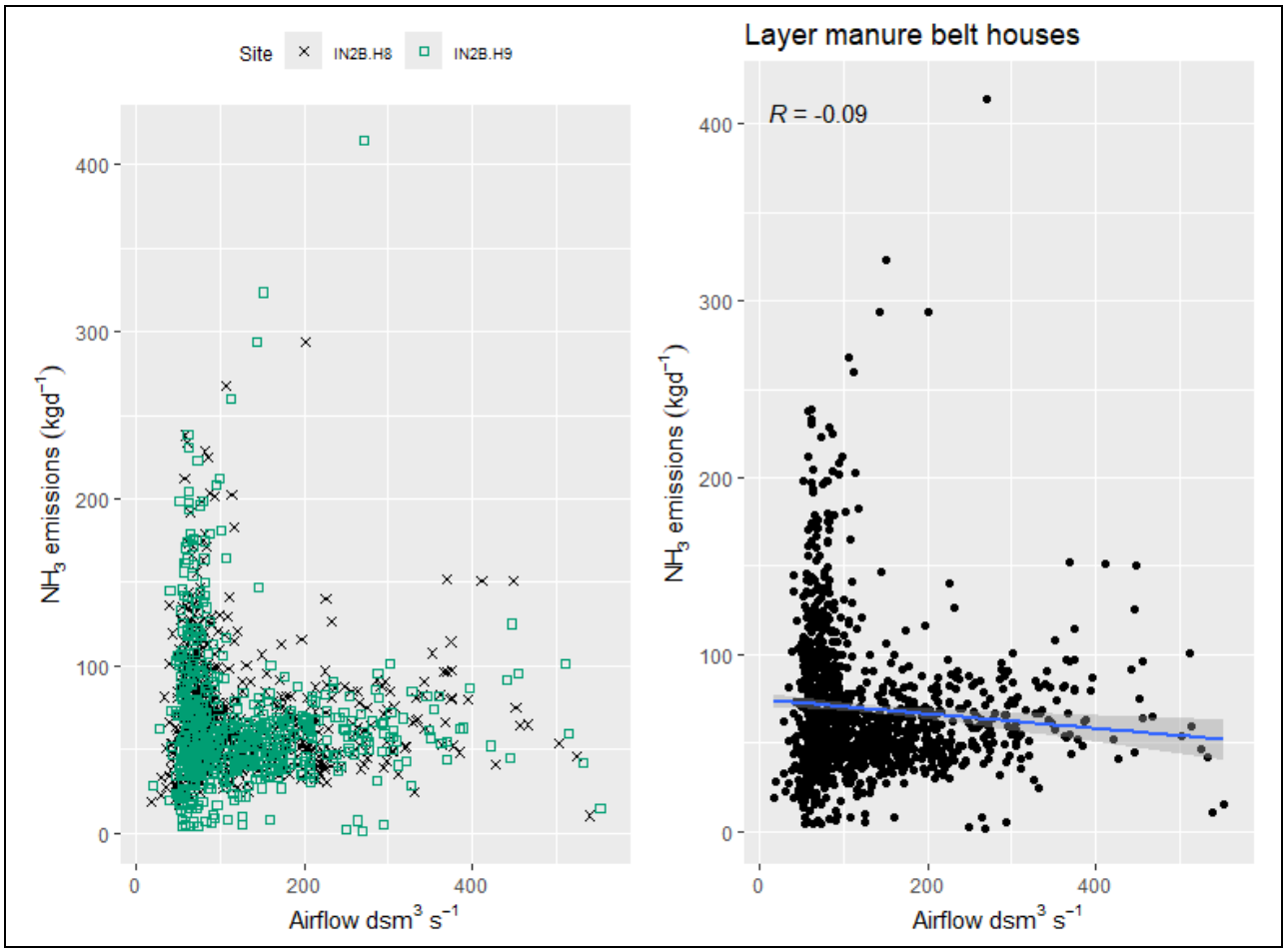

Figure 2.11: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus airflow.

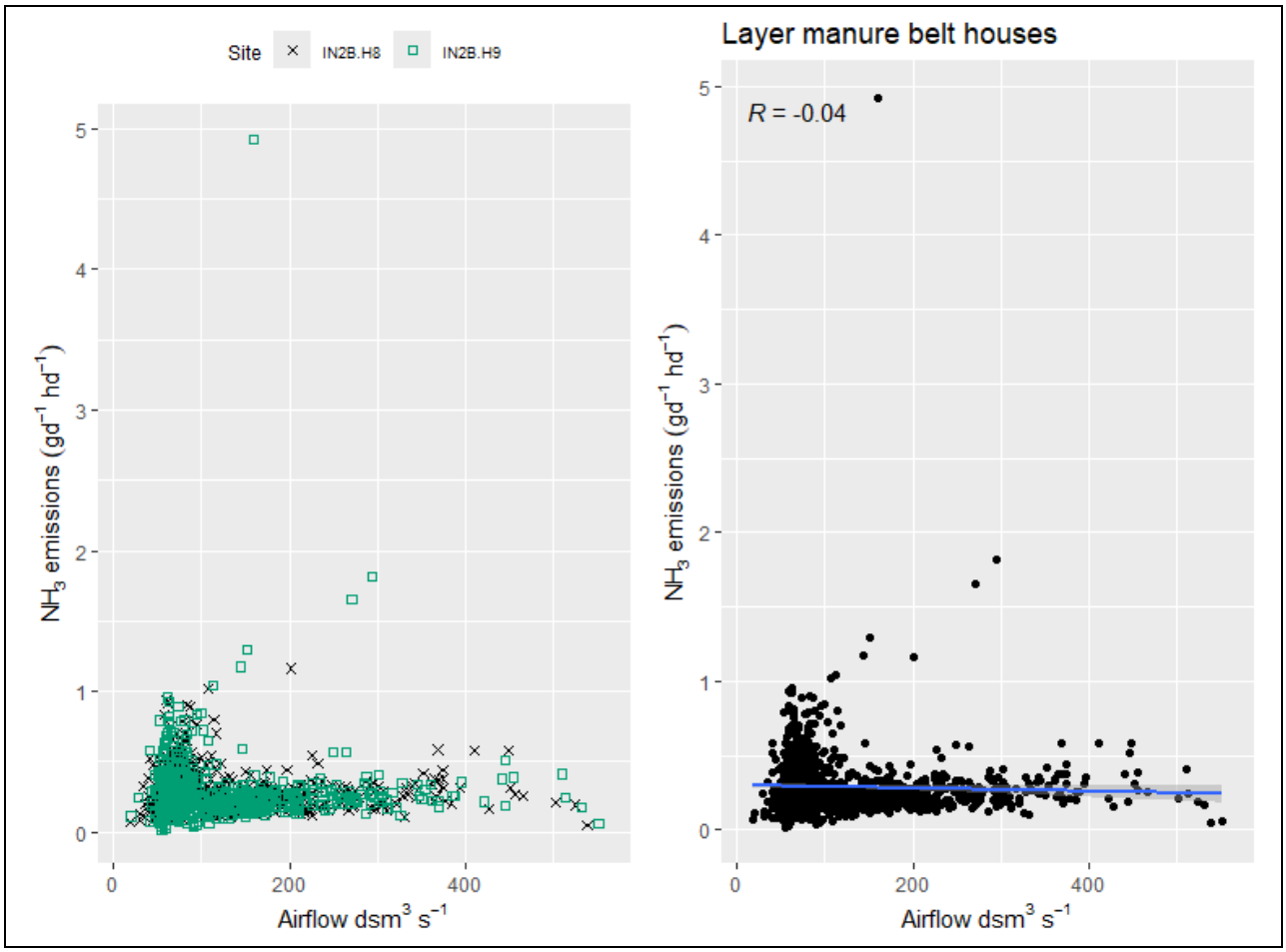

Figure 2.12: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus airflow.

2.1.2 Hydrogen Sulfide (H_2S)

2.1.2.1 Inventory

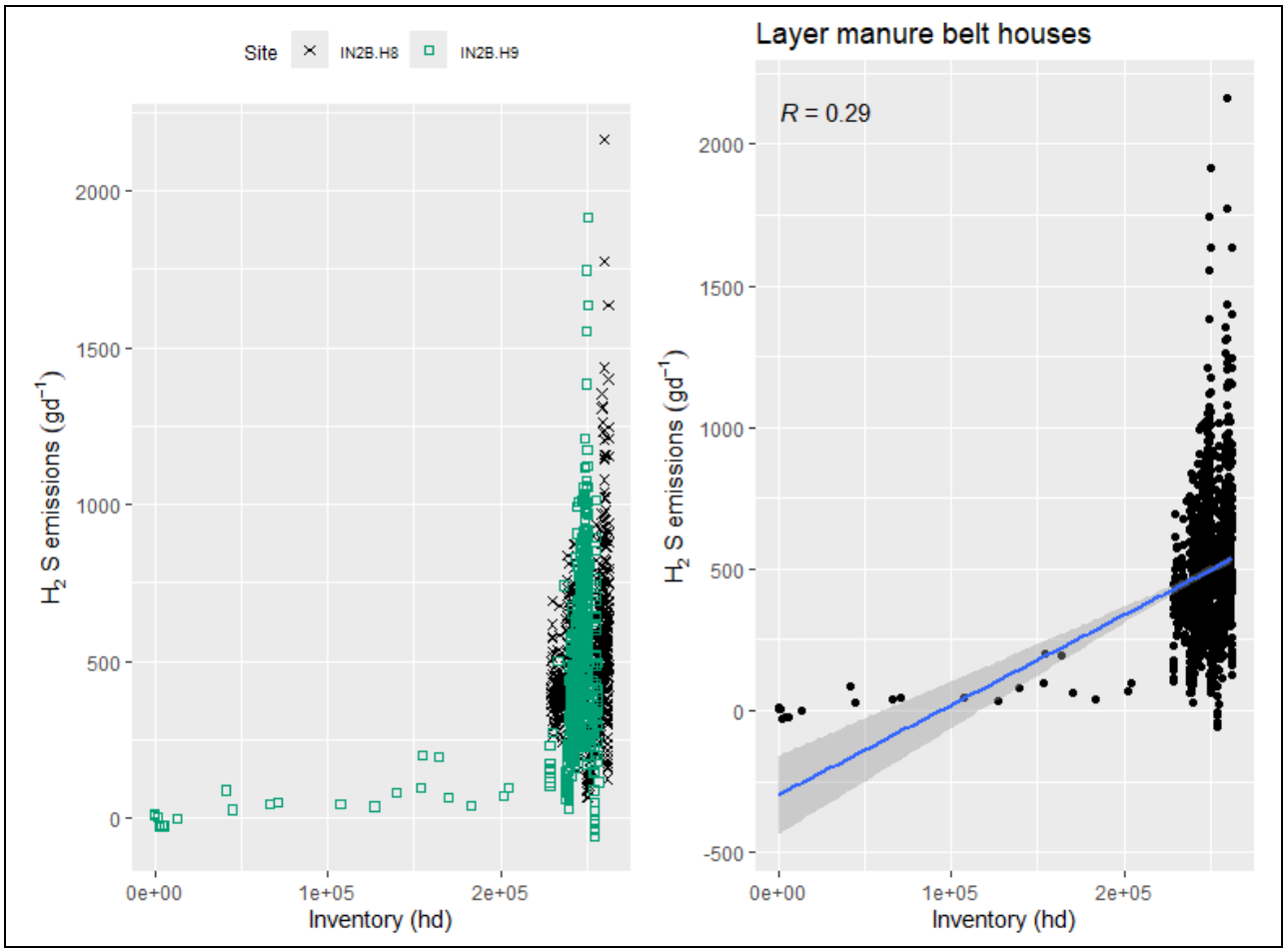

Figure 2.13: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus Inventory.

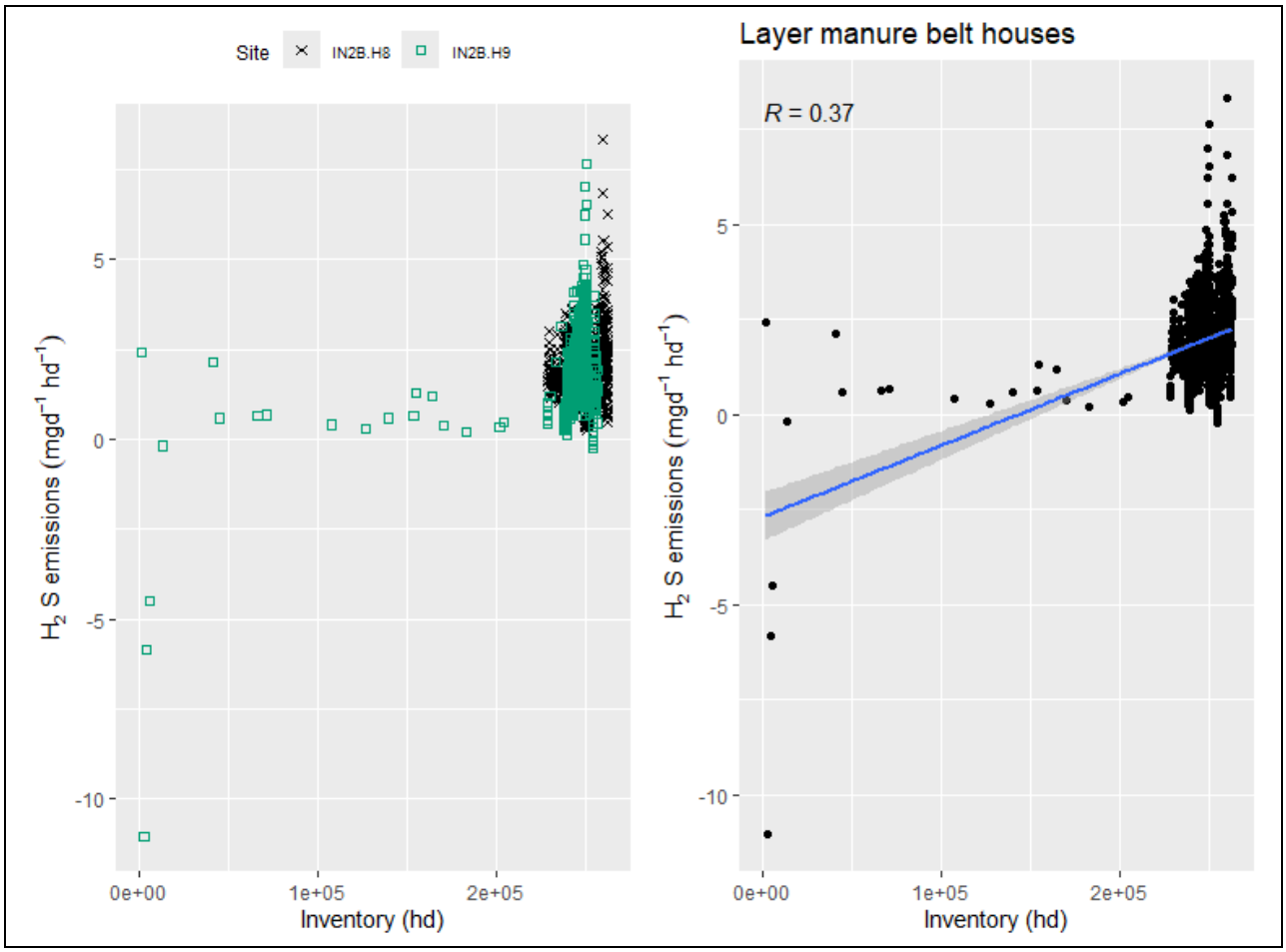

Figure 2.14: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

2.1.2.2 Average animal weight

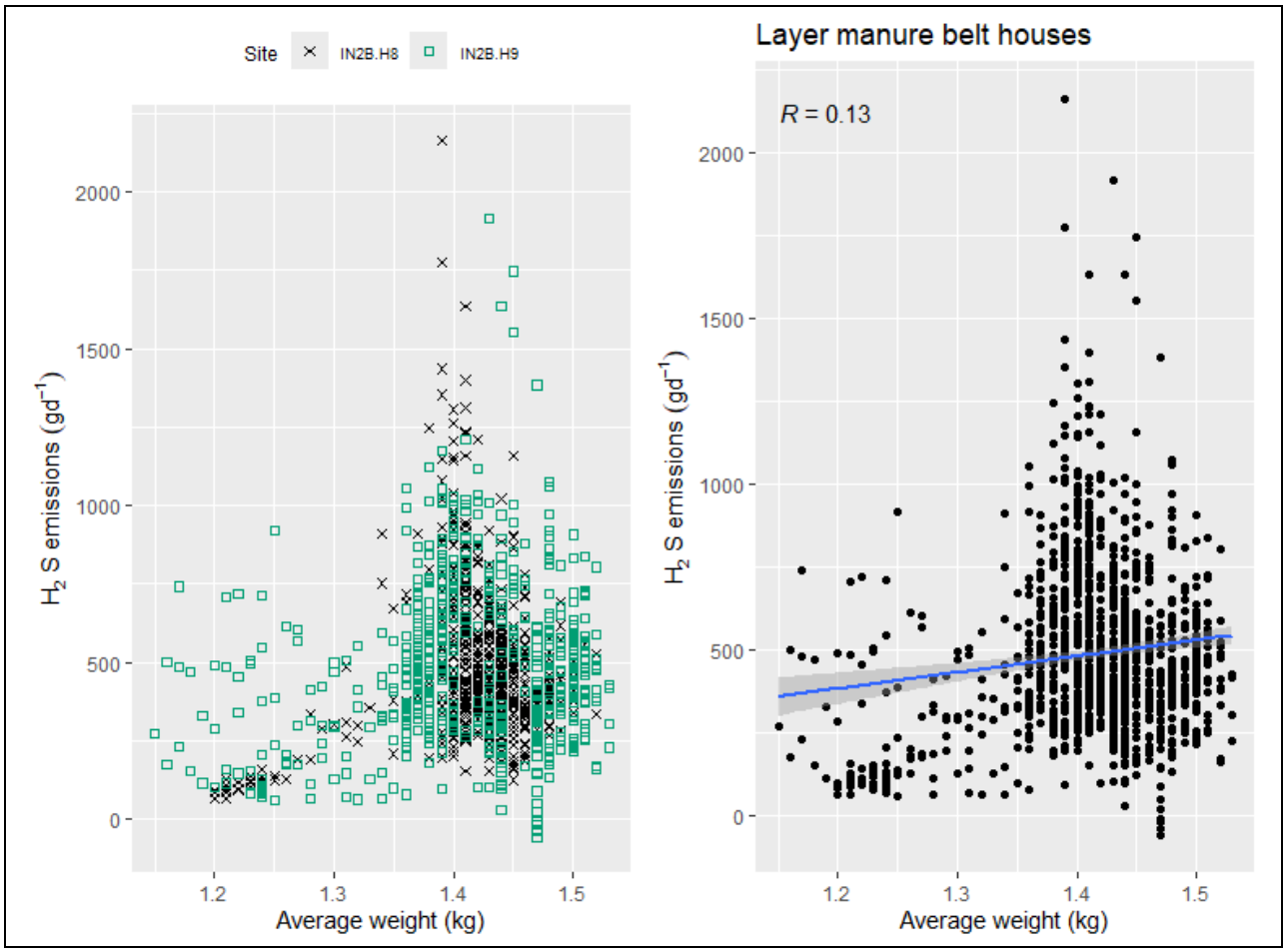

Figure 2.15: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus average animal weight.

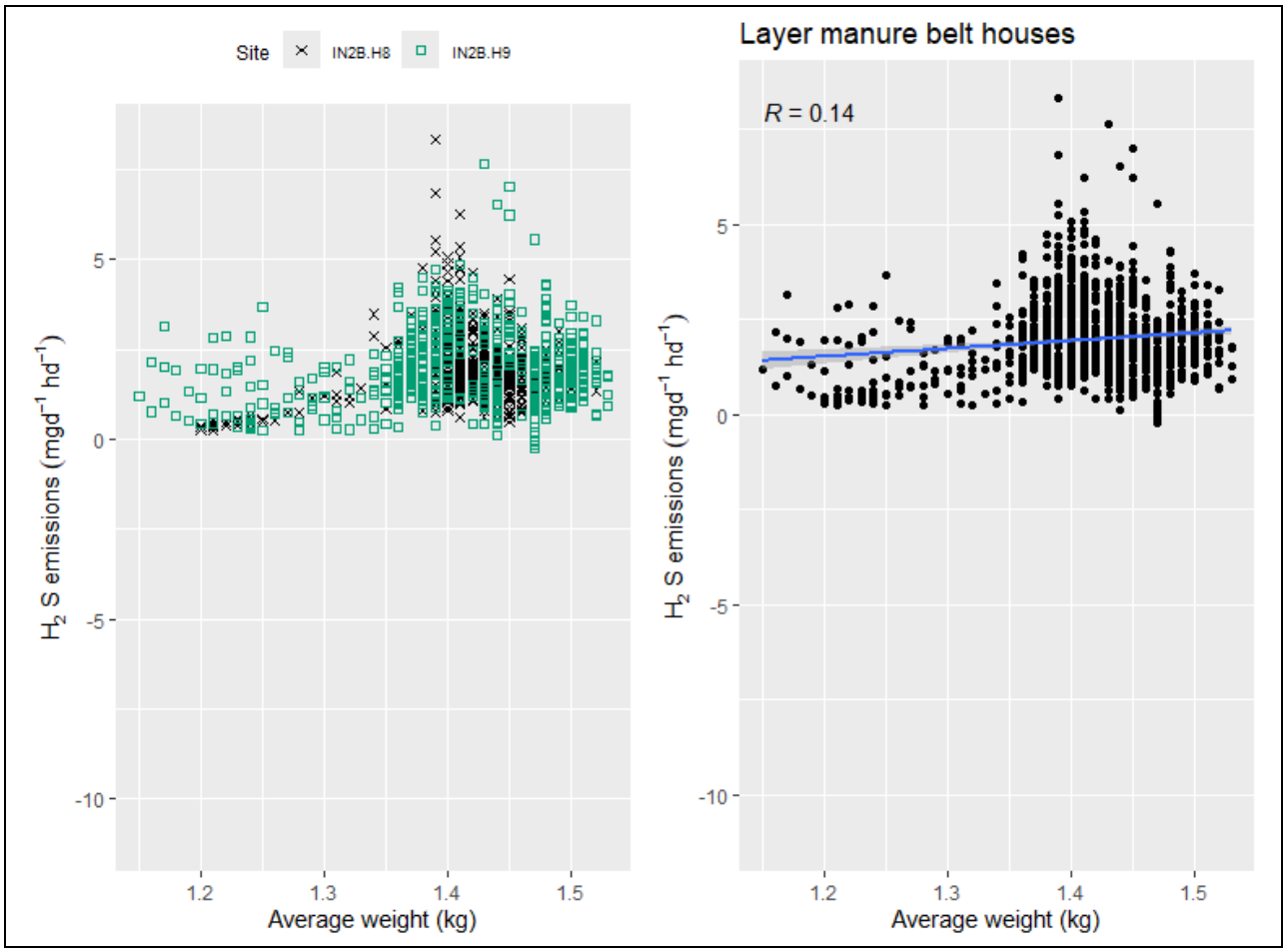

Figure 2.16: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

2.1.2.3 Live animal weight

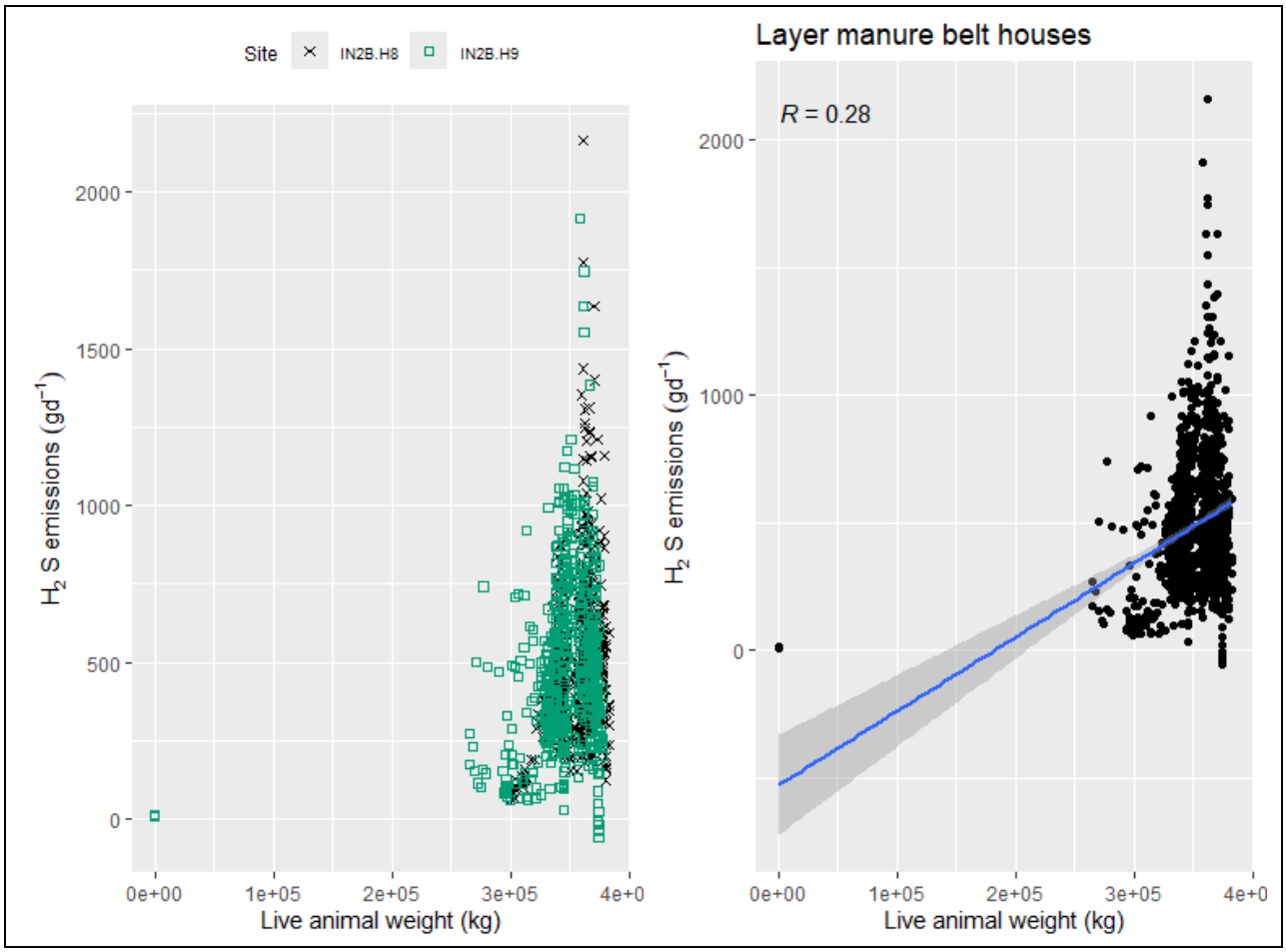

Figure 2.17: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus live animal weight.

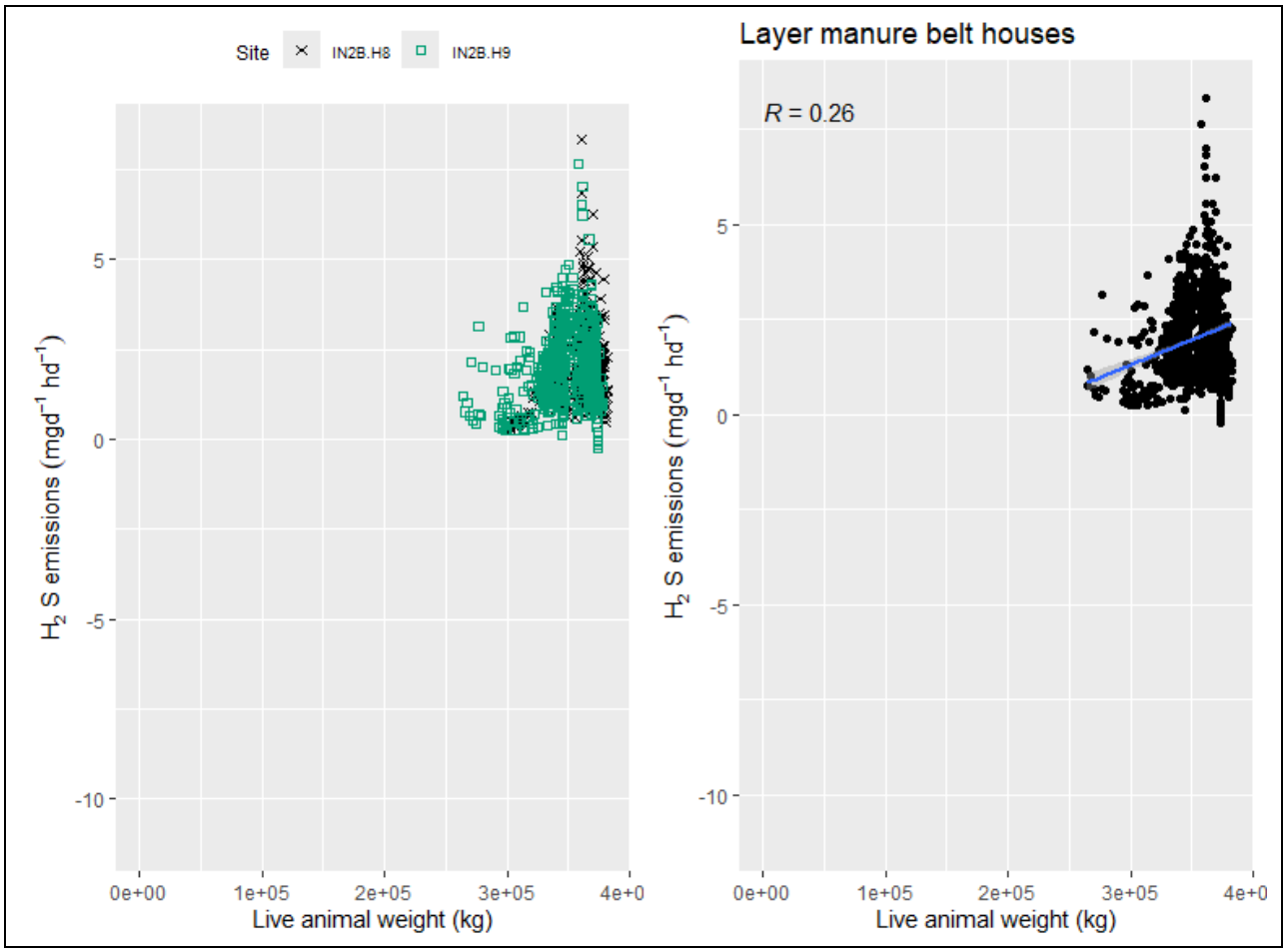

Figure 2.18: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

2.1.2.4 *Exhaust temperature*

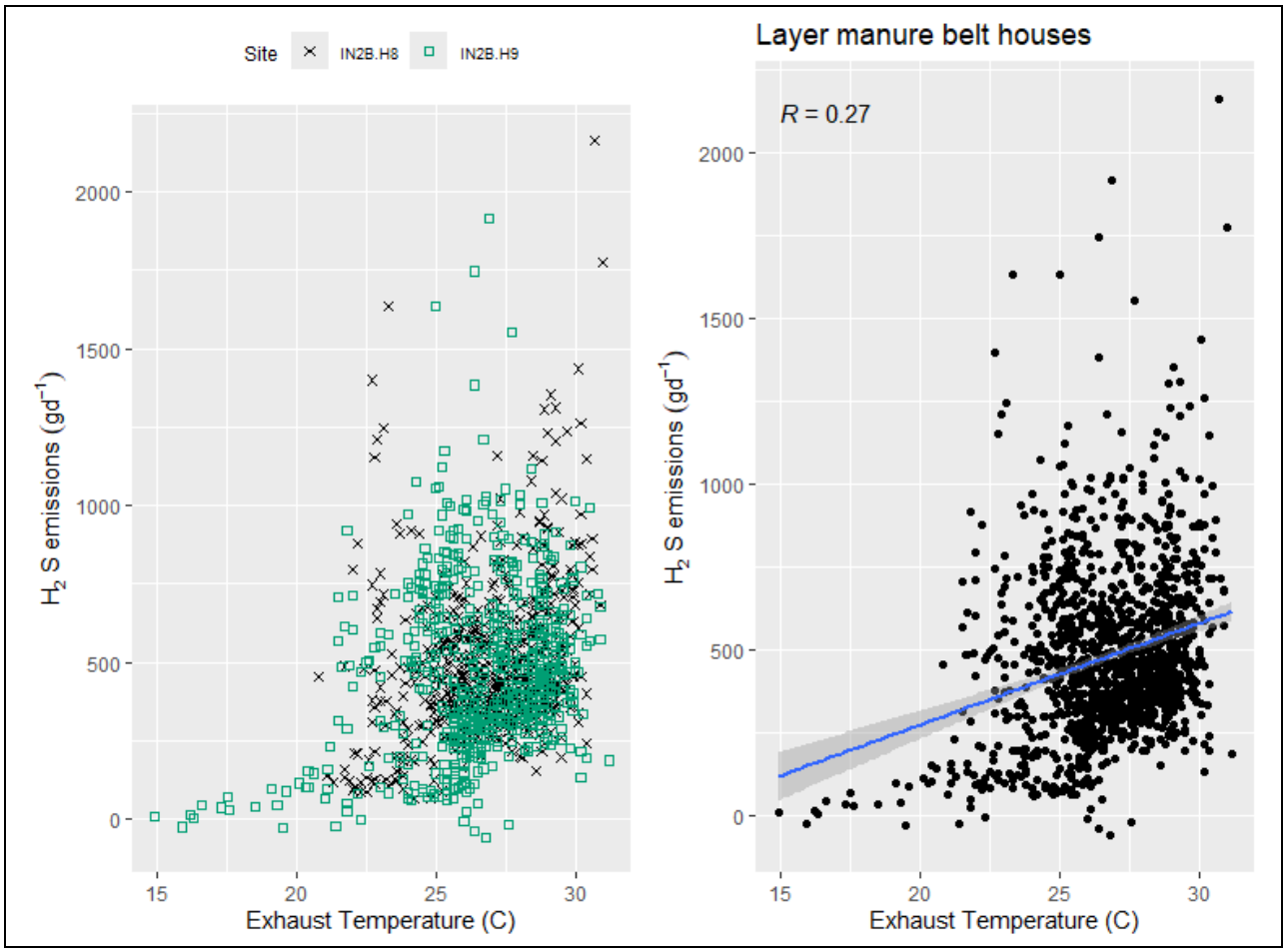

Figure 2.19: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus exhaust temperature.

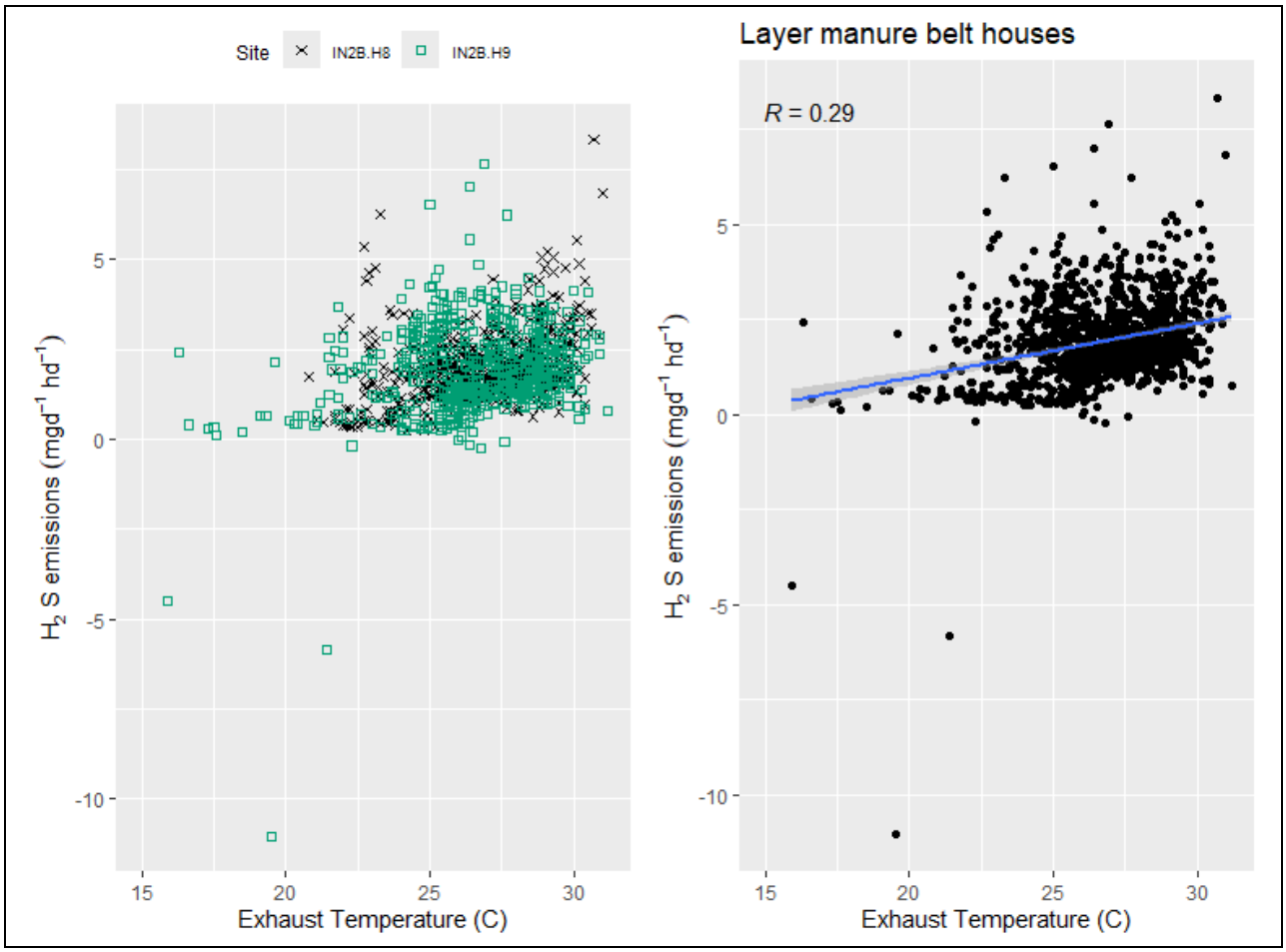

Figure 2.20: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

2.1.2.5 *Exhaust relative humidity*

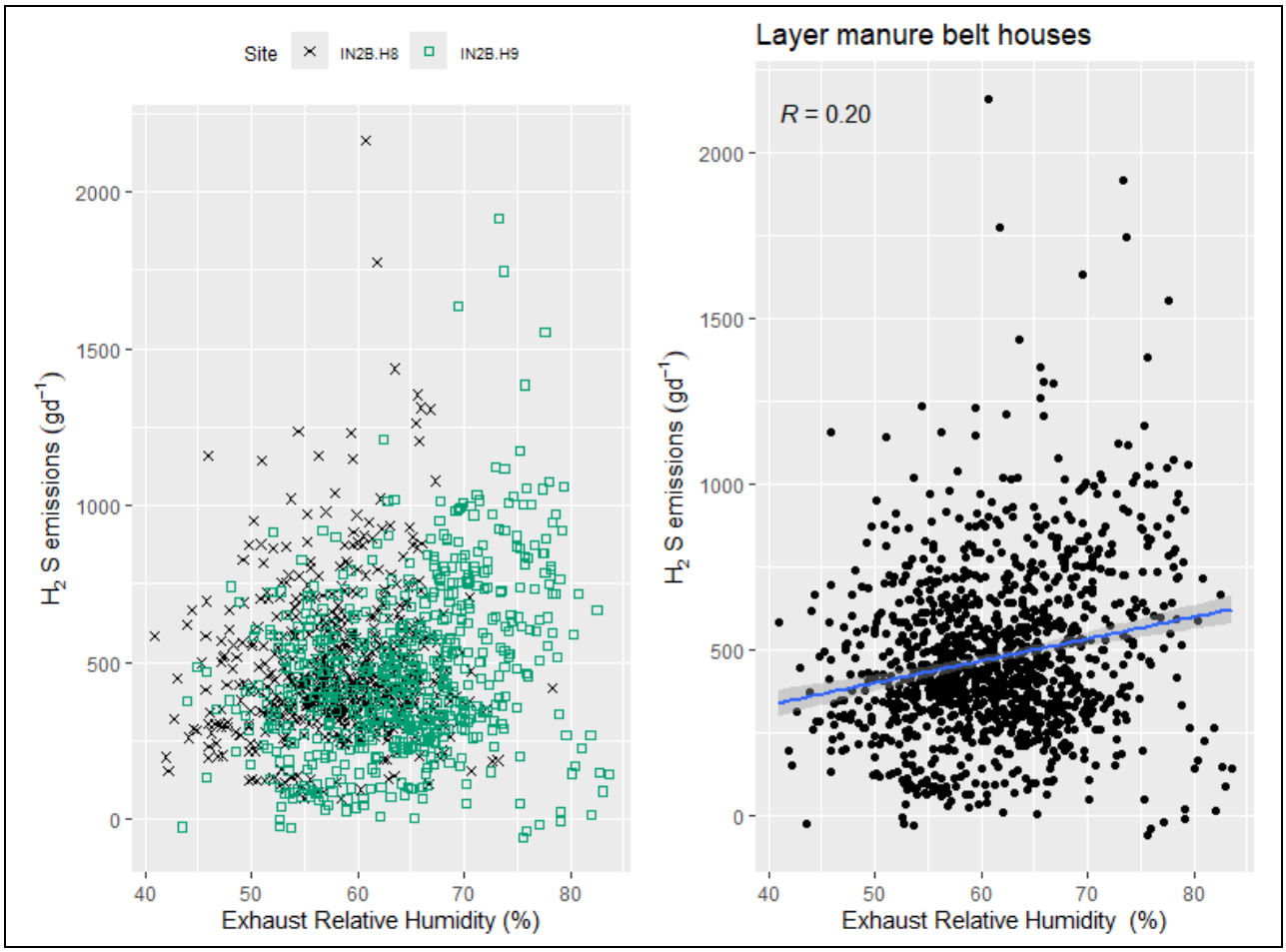

Figure 2.21: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus exhaust relative humidity.

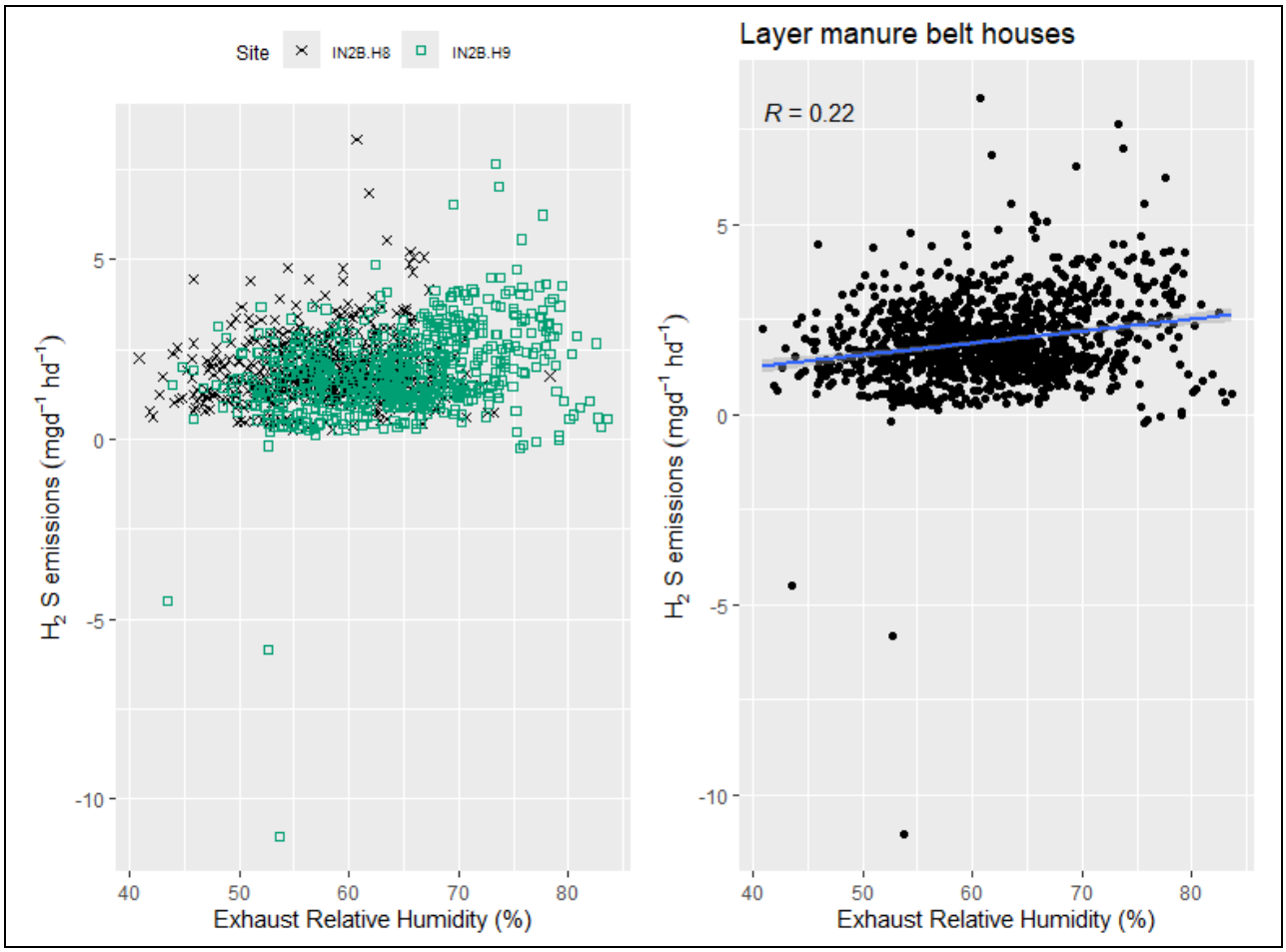

Figure 2.22: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

2.1.2.6 Airflow

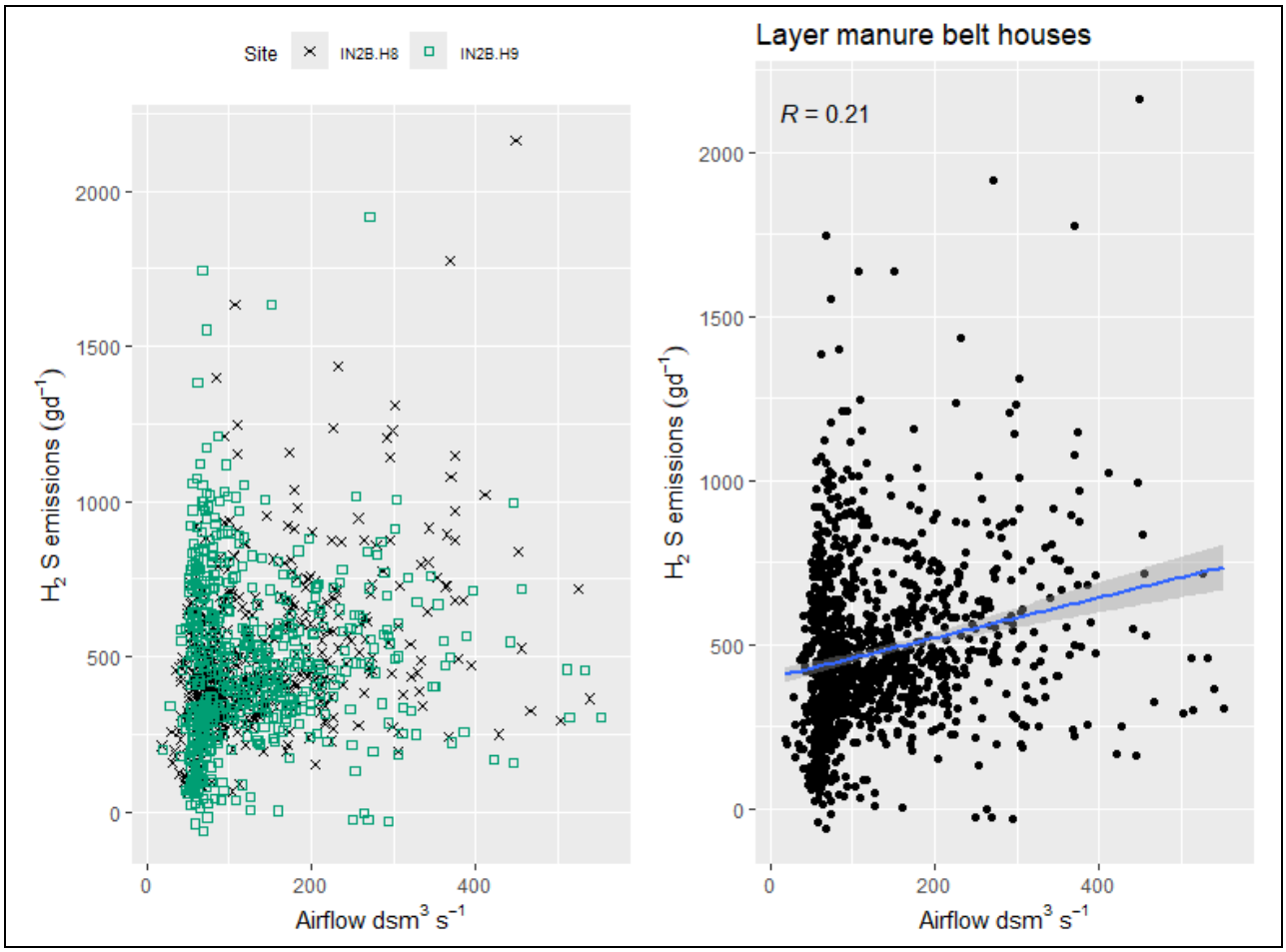

Figure 2.23: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus airflow.

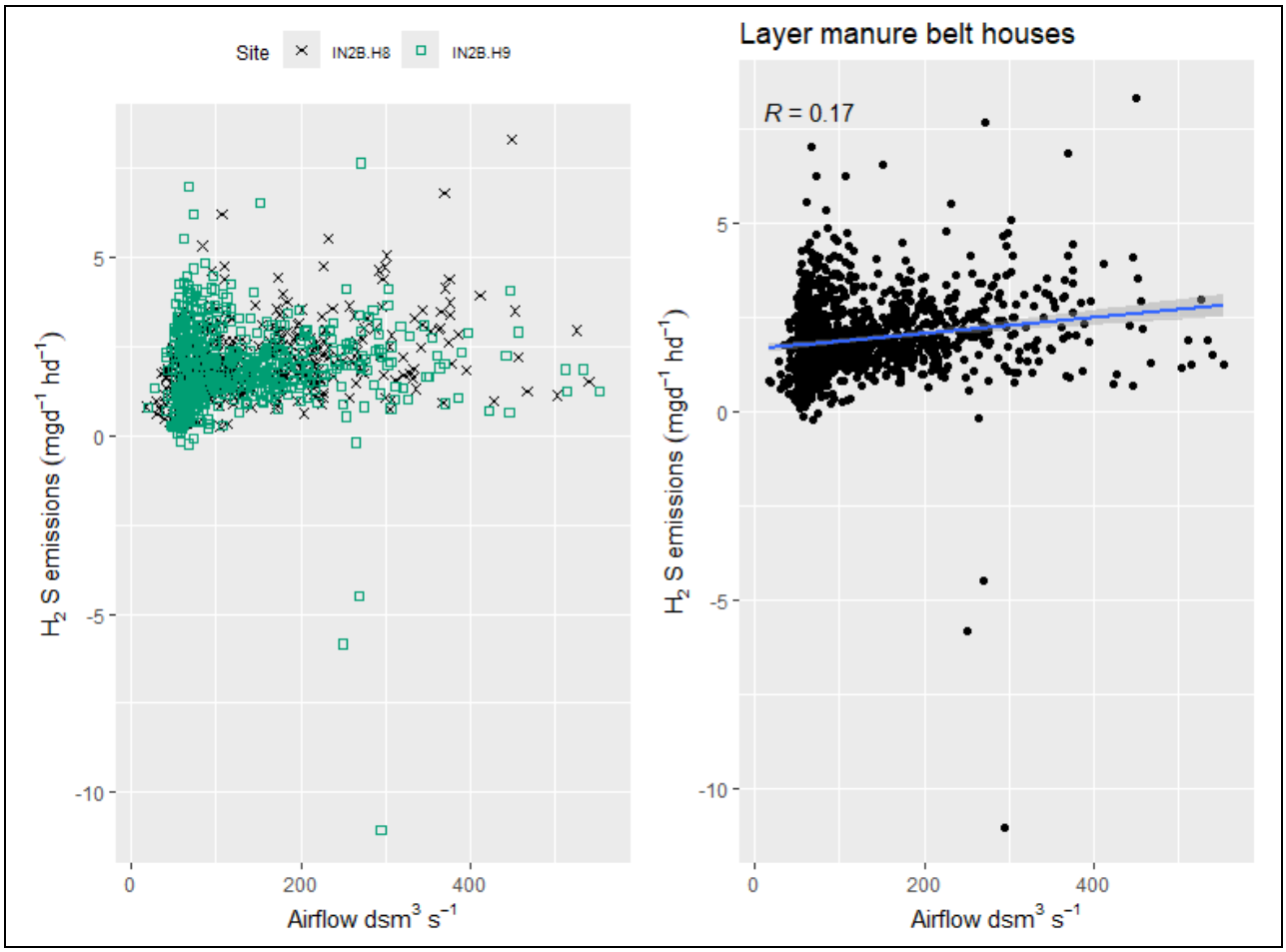

Figure 2.24: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus airflow.

2.1.3 Particulate Matter (PM_{10})

2.1.3.1 Inventory

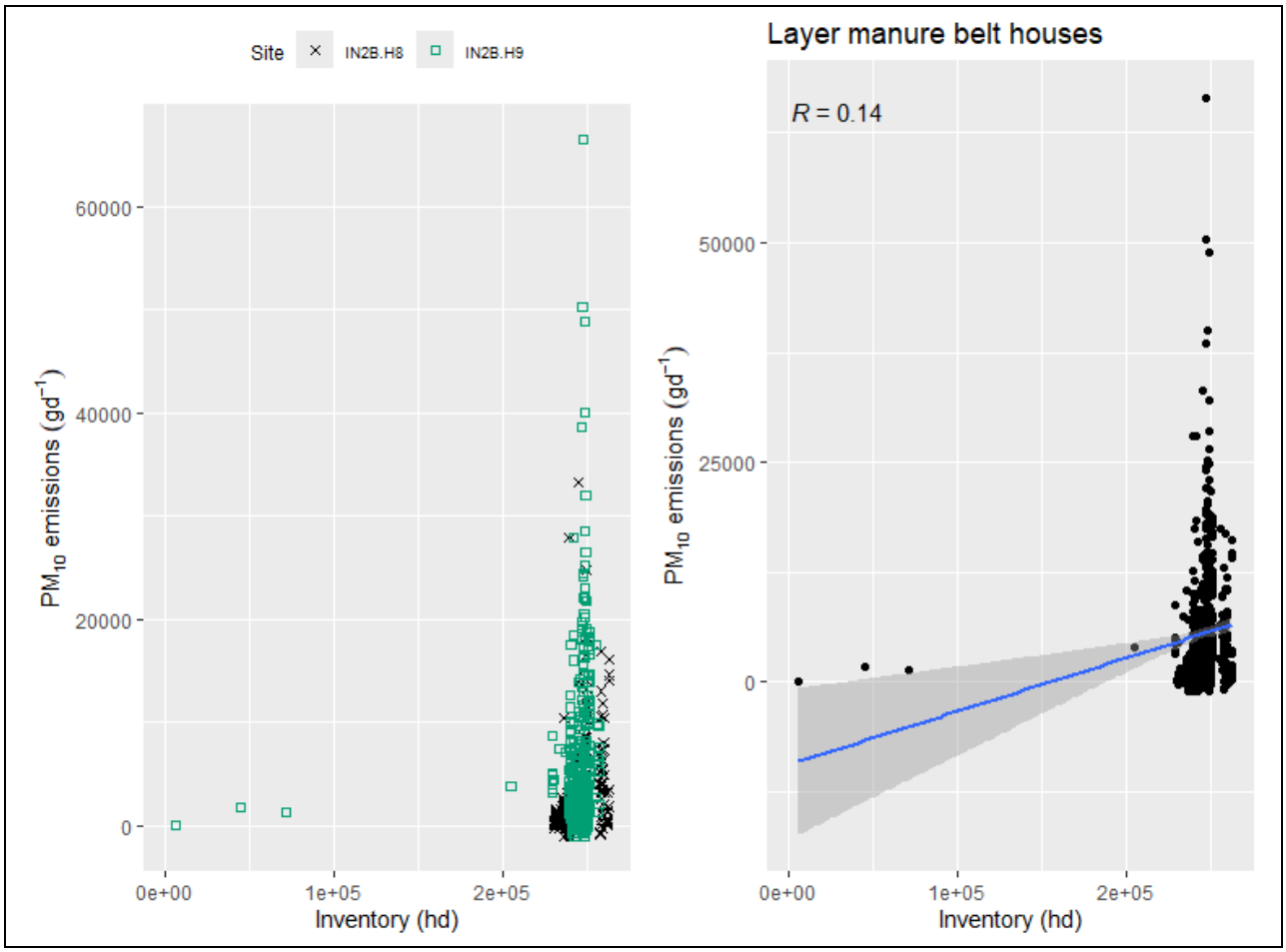

Figure 2.25: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus Inventory.

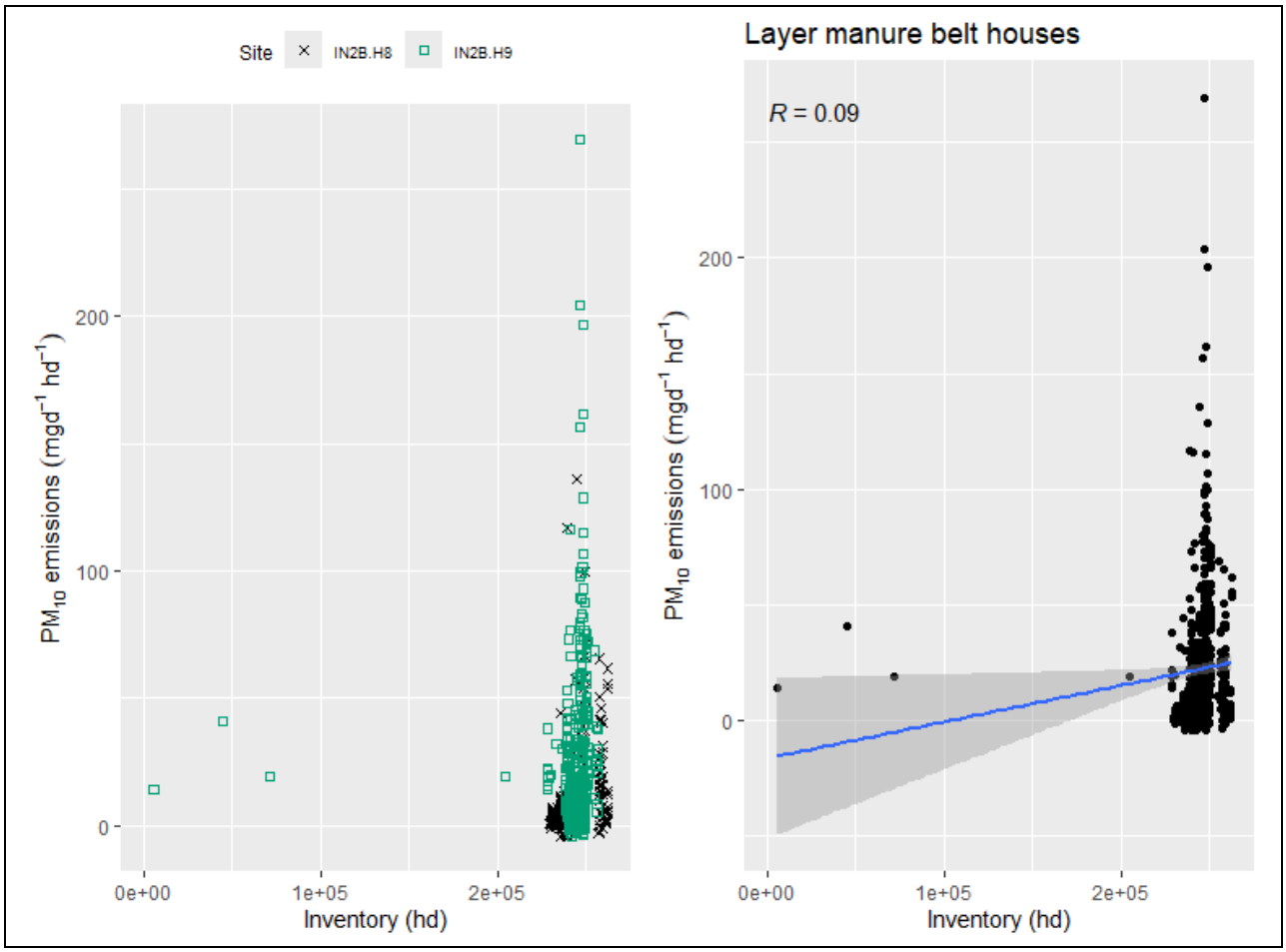

Figure 2.26: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

2.1.3.2 *Average animal weight*

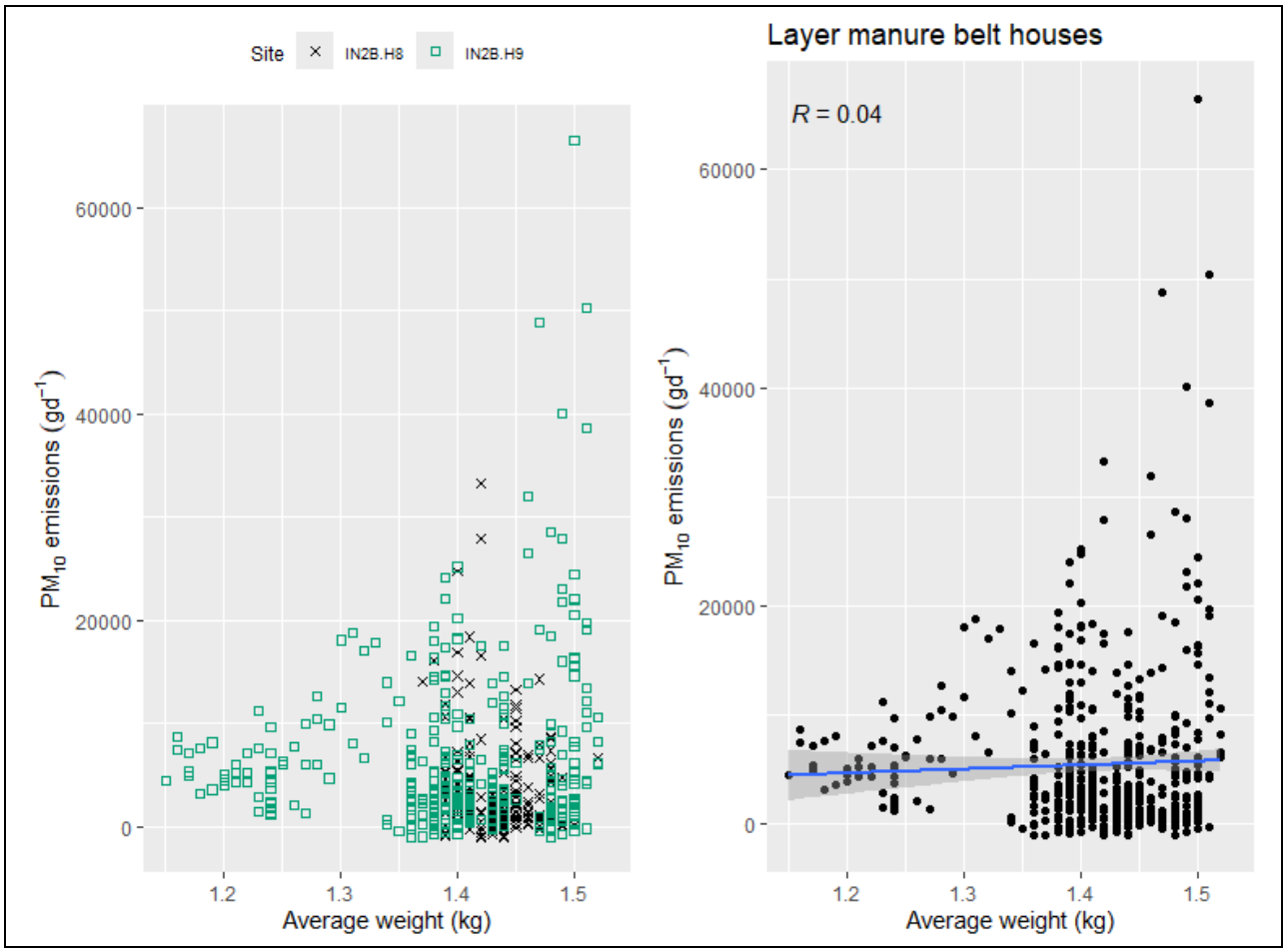

Figure 2.27: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus average animal weight.

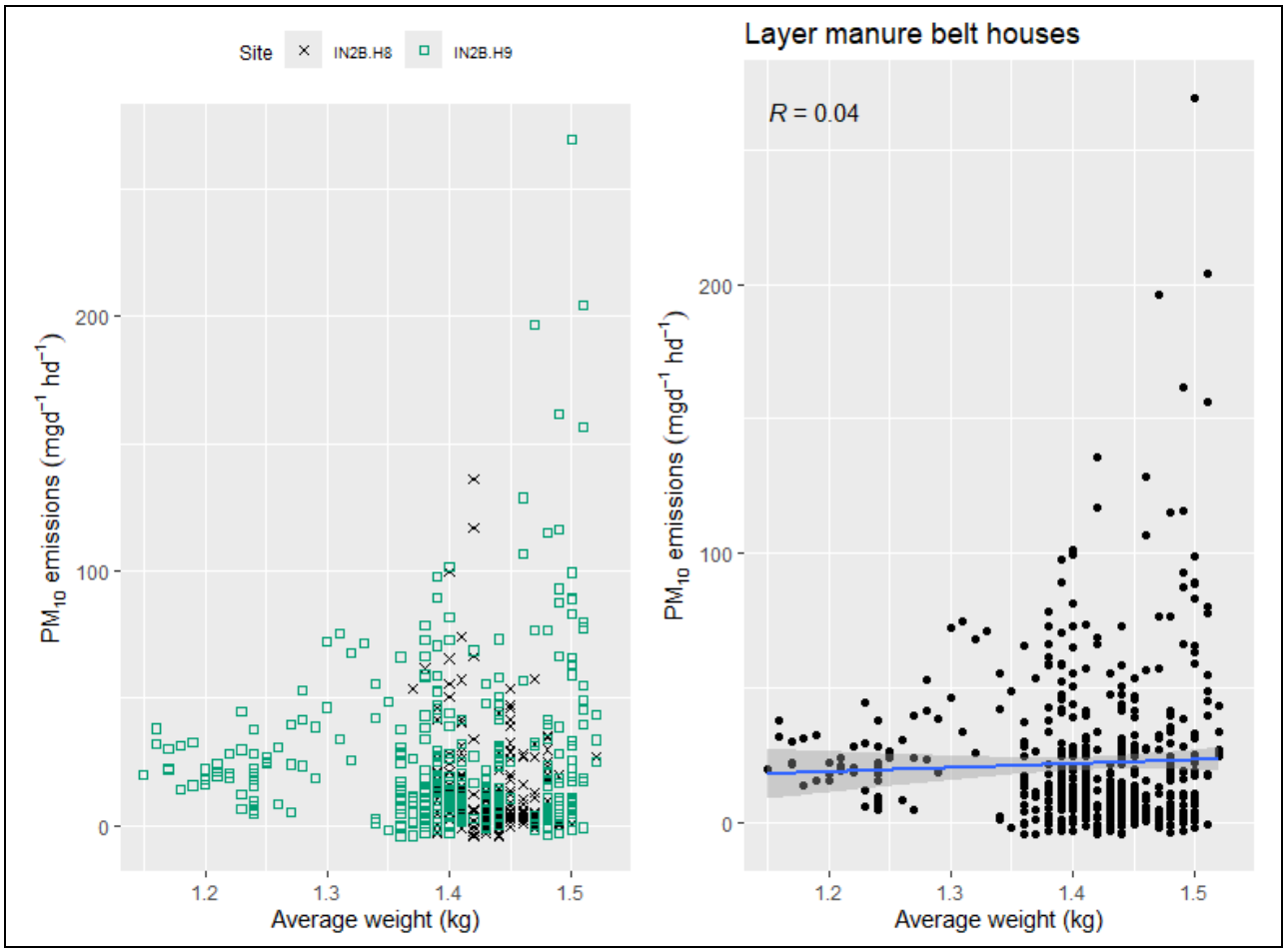

Figure 2.28: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

2.1.3.3 Live animal weight

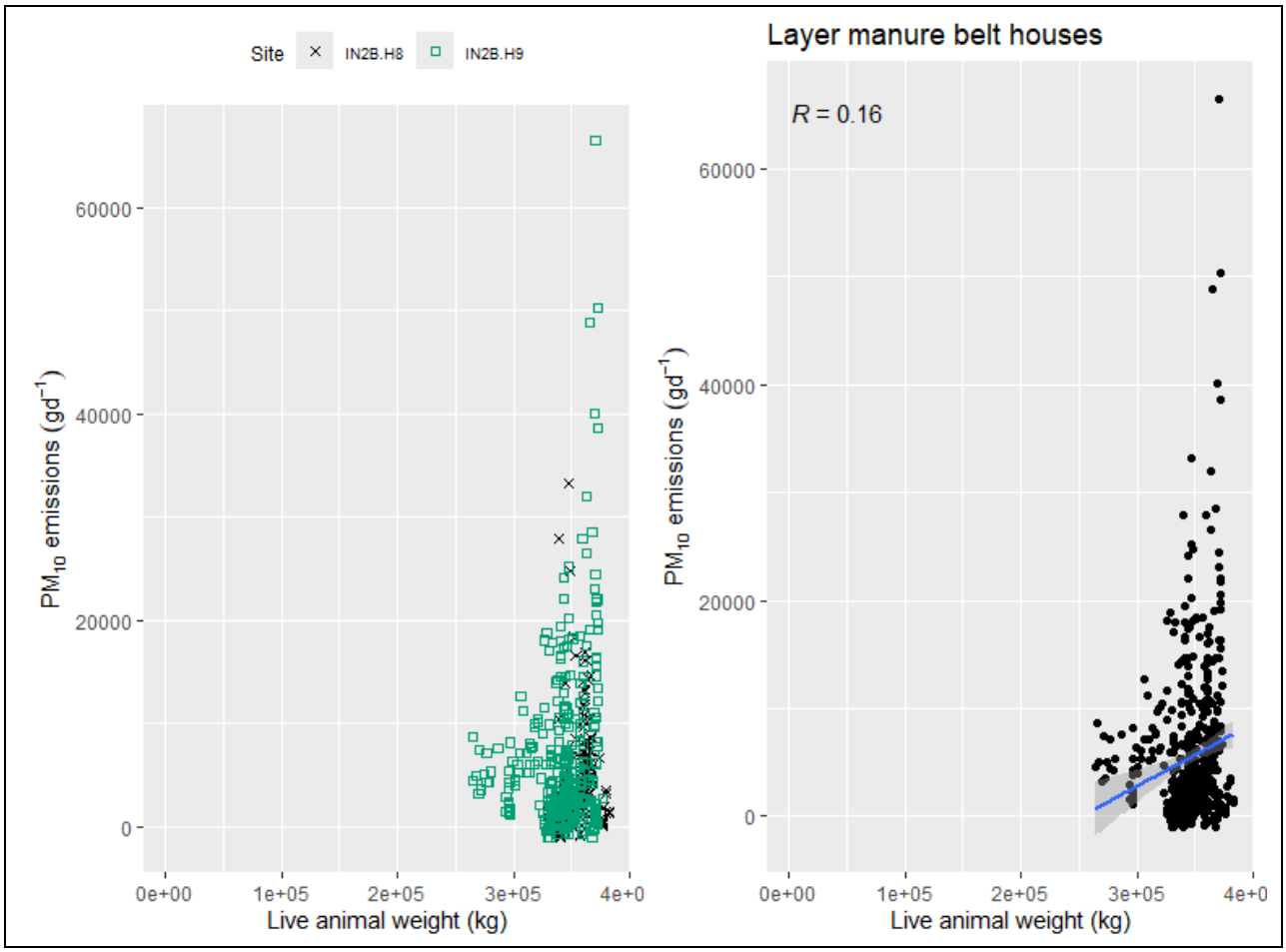

Figure 2.29: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus live animal weight.

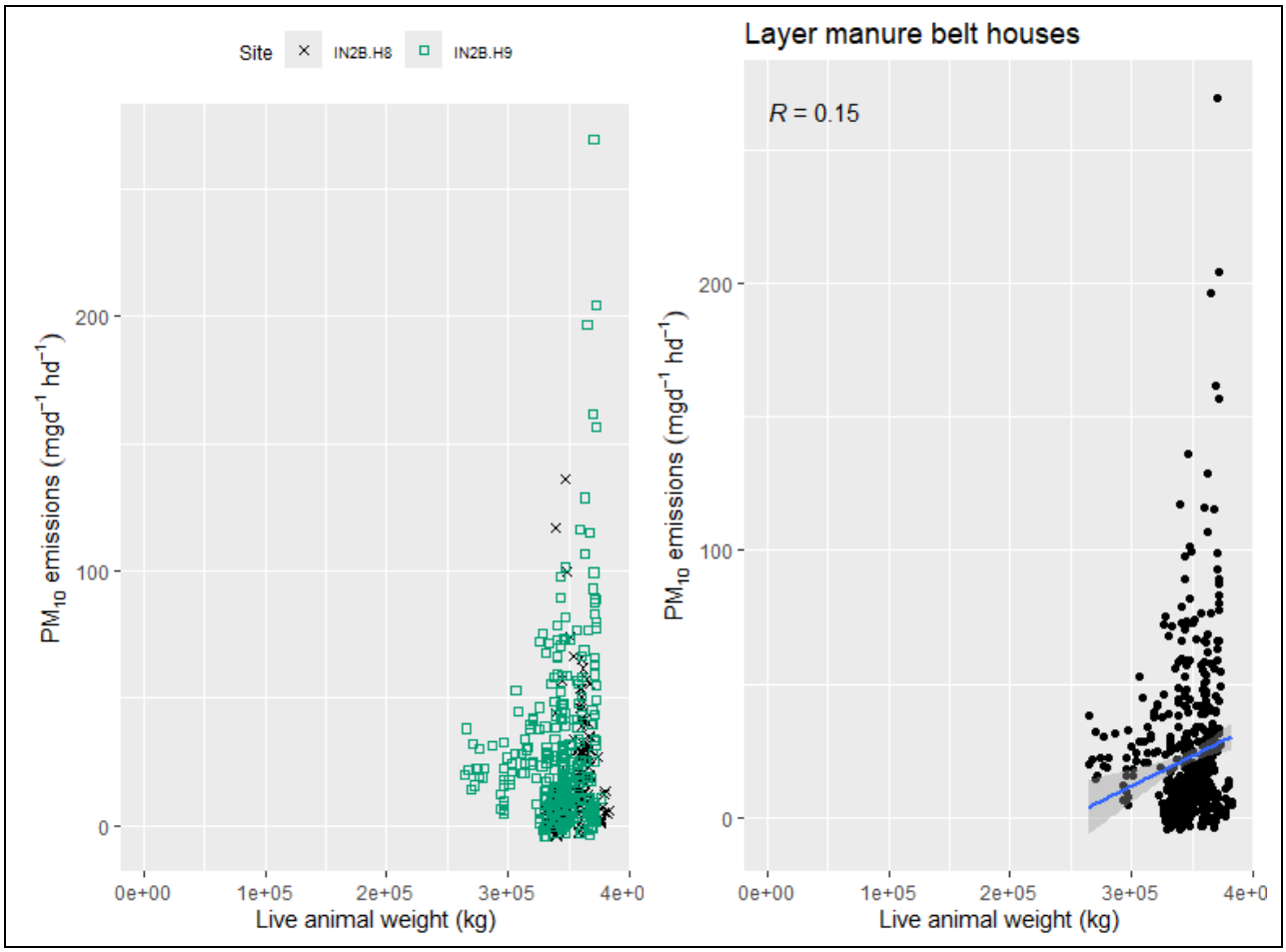

Figure 2.30: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

2.1.3.4 *Exhaust temperature*

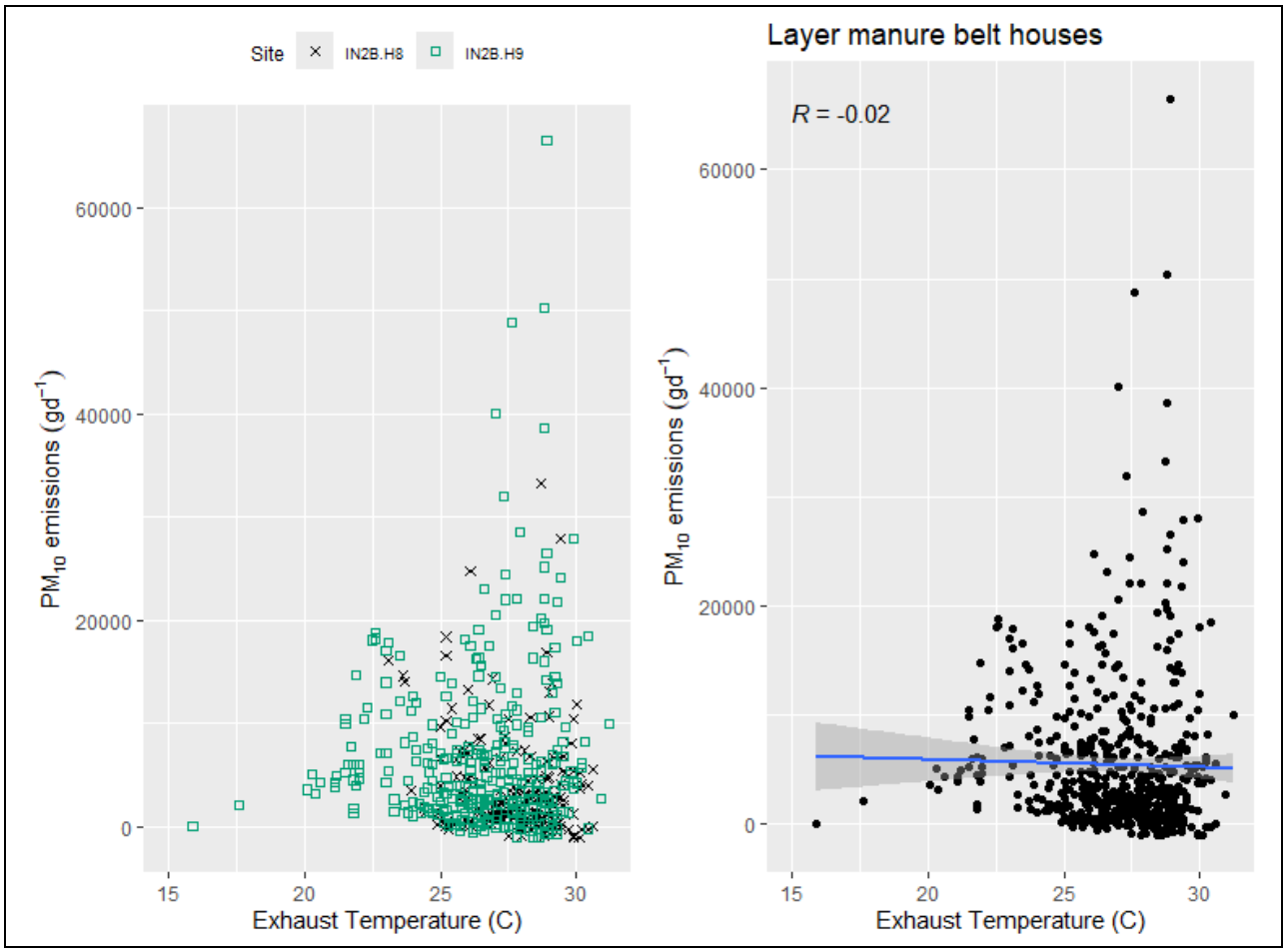

Figure 2.31: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus exhaust temperature.

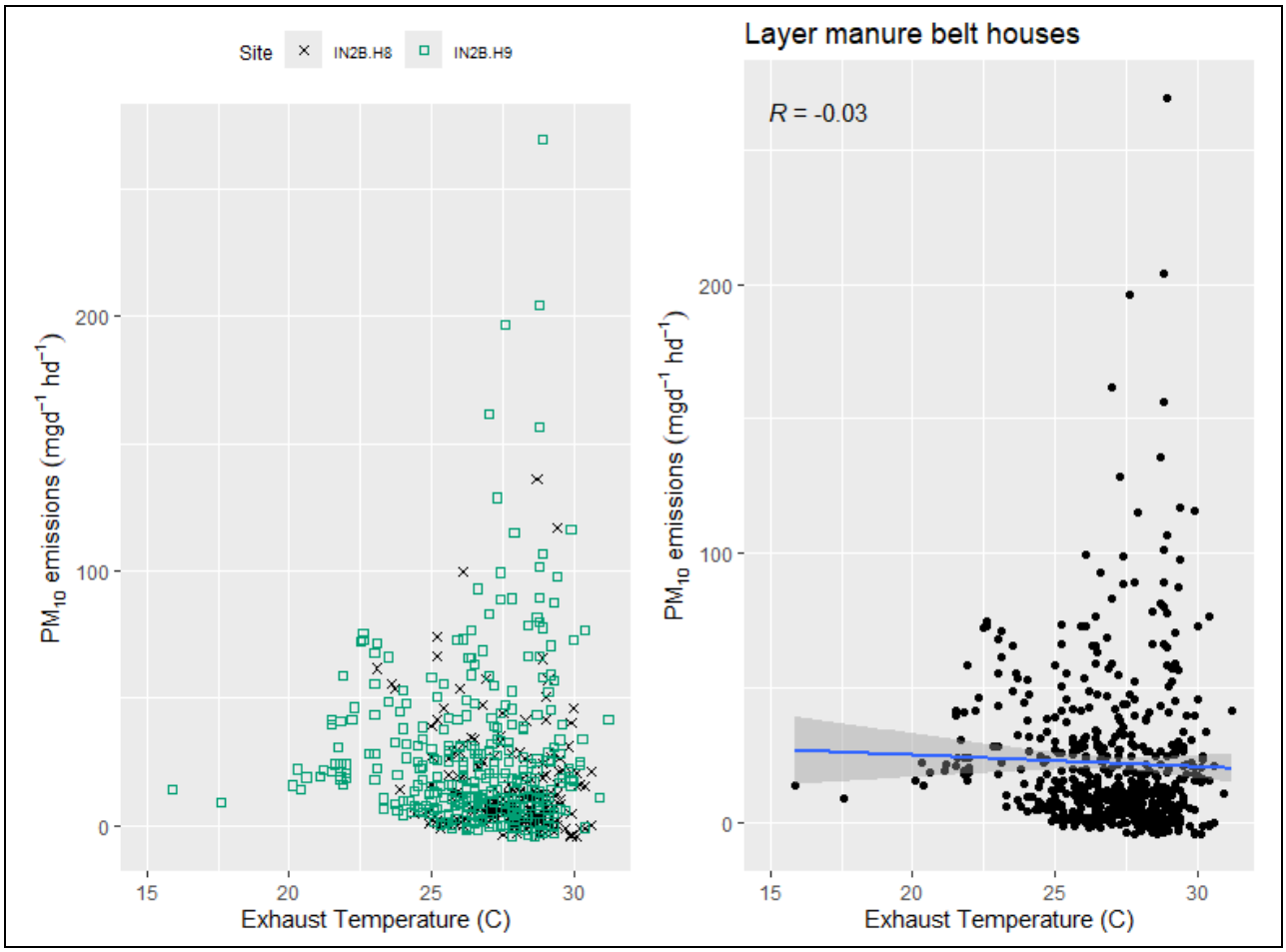

Figure 2.32: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

2.1.3.5 Exhaust relative humidity

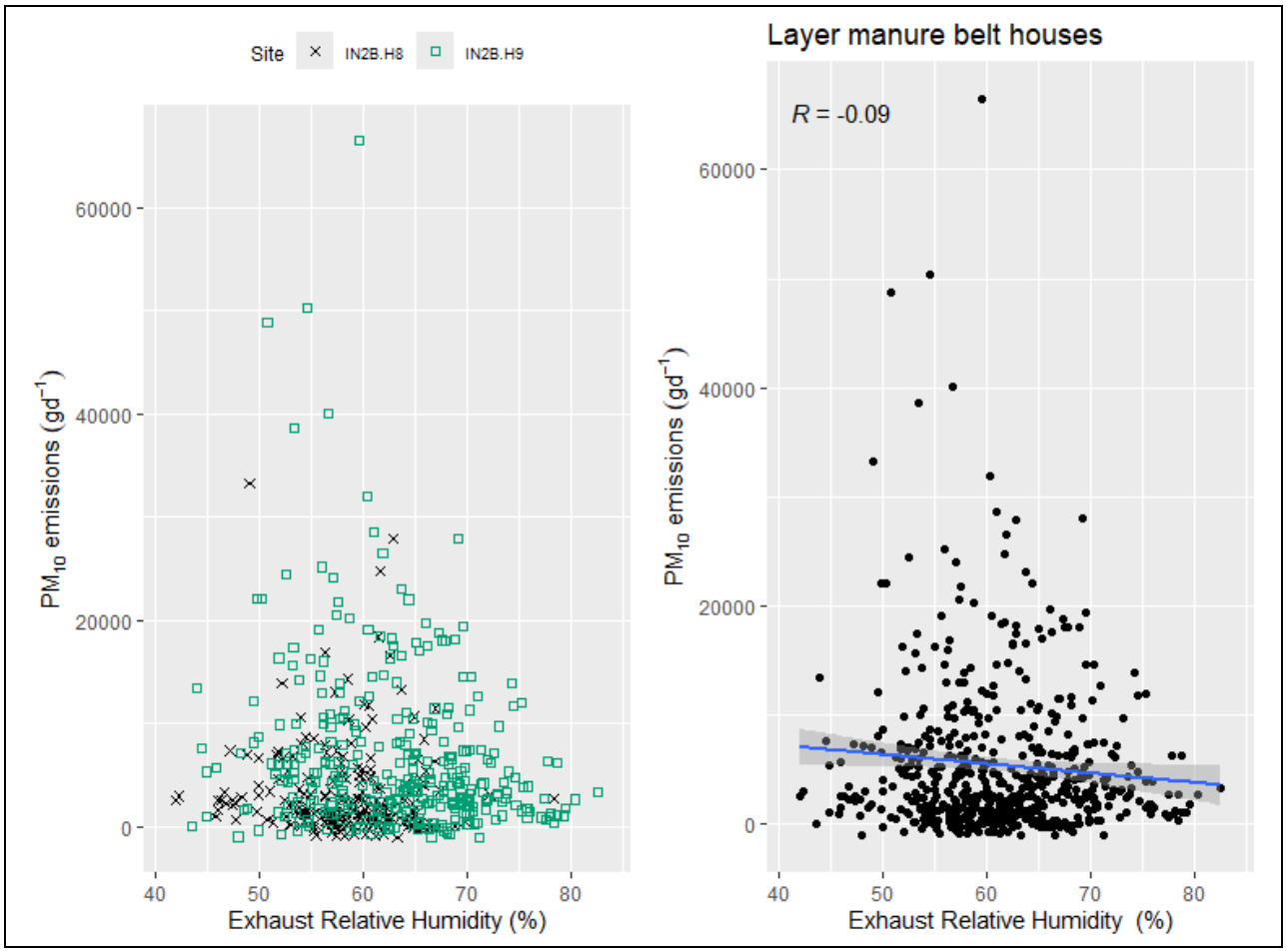

Figure 2.33: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus exhaust relative humidity.

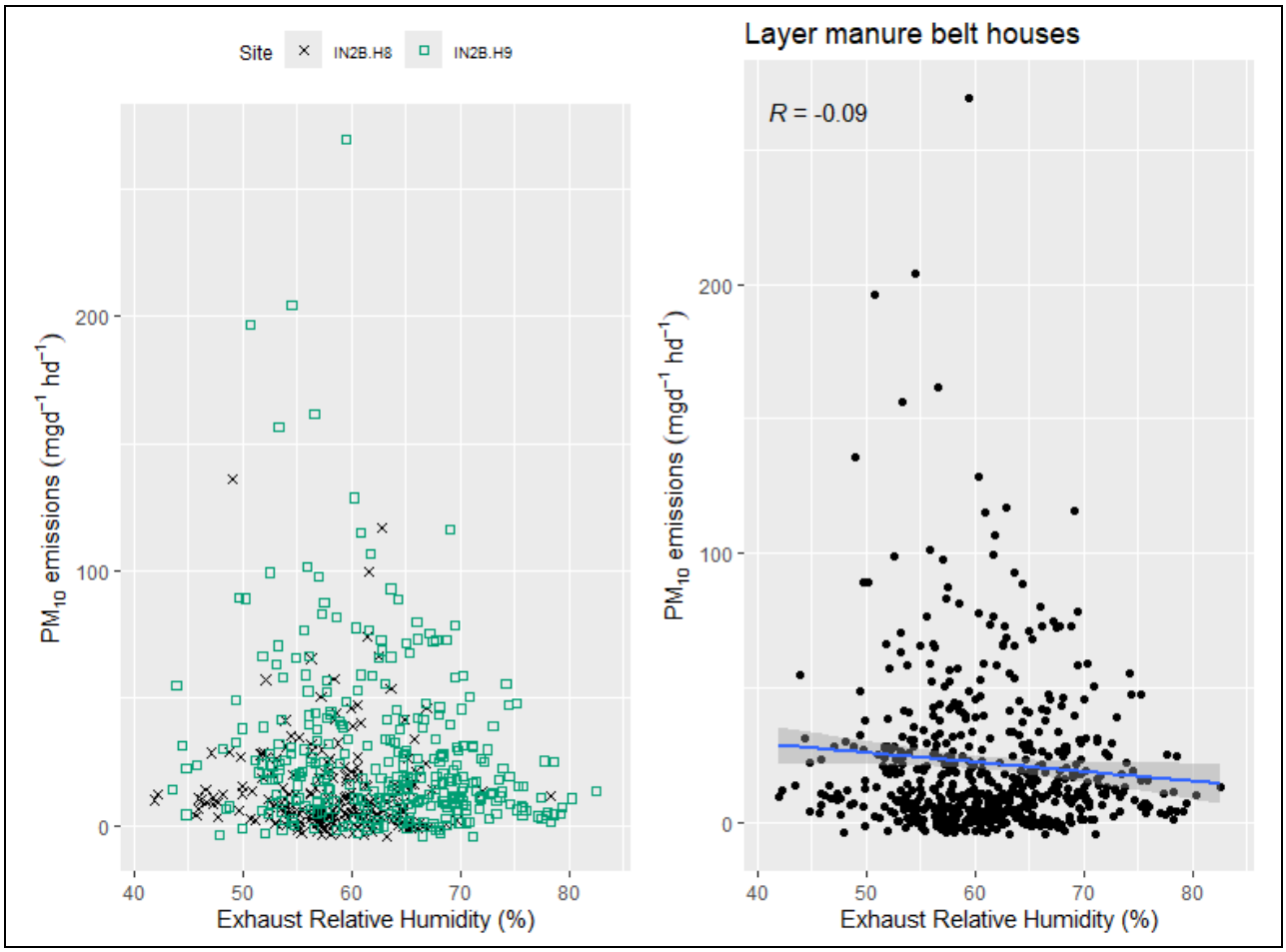

Figure 2.34: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

2.1.3.6 *Airflow*

Figure 2.35: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus airflow.

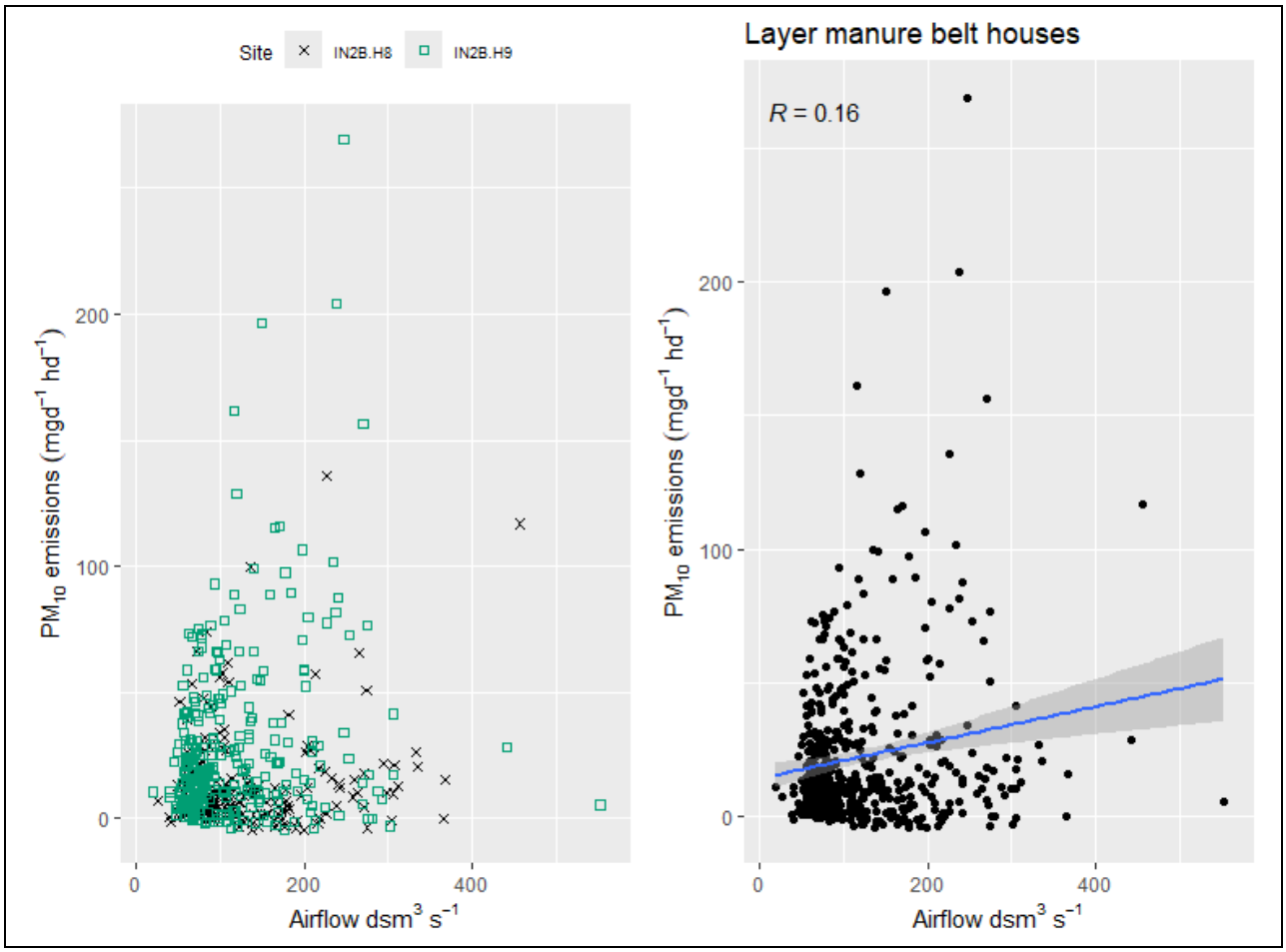

Figure 2.36: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus airflow.

2.1.4 Particulate Matter ($PM_{2.5}$)

2.1.4.1 Inventory

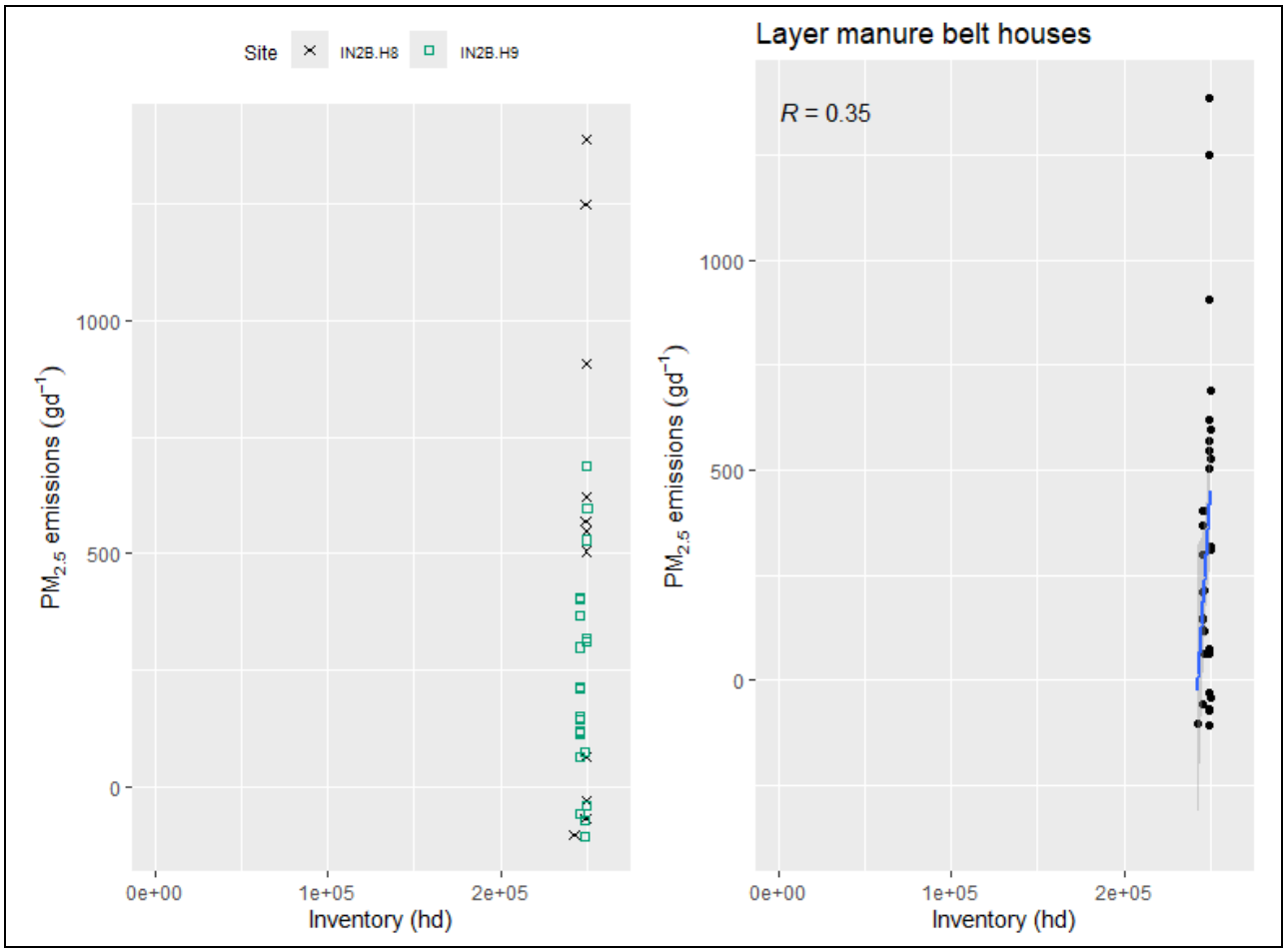

Figure 2.37: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus Inventory.

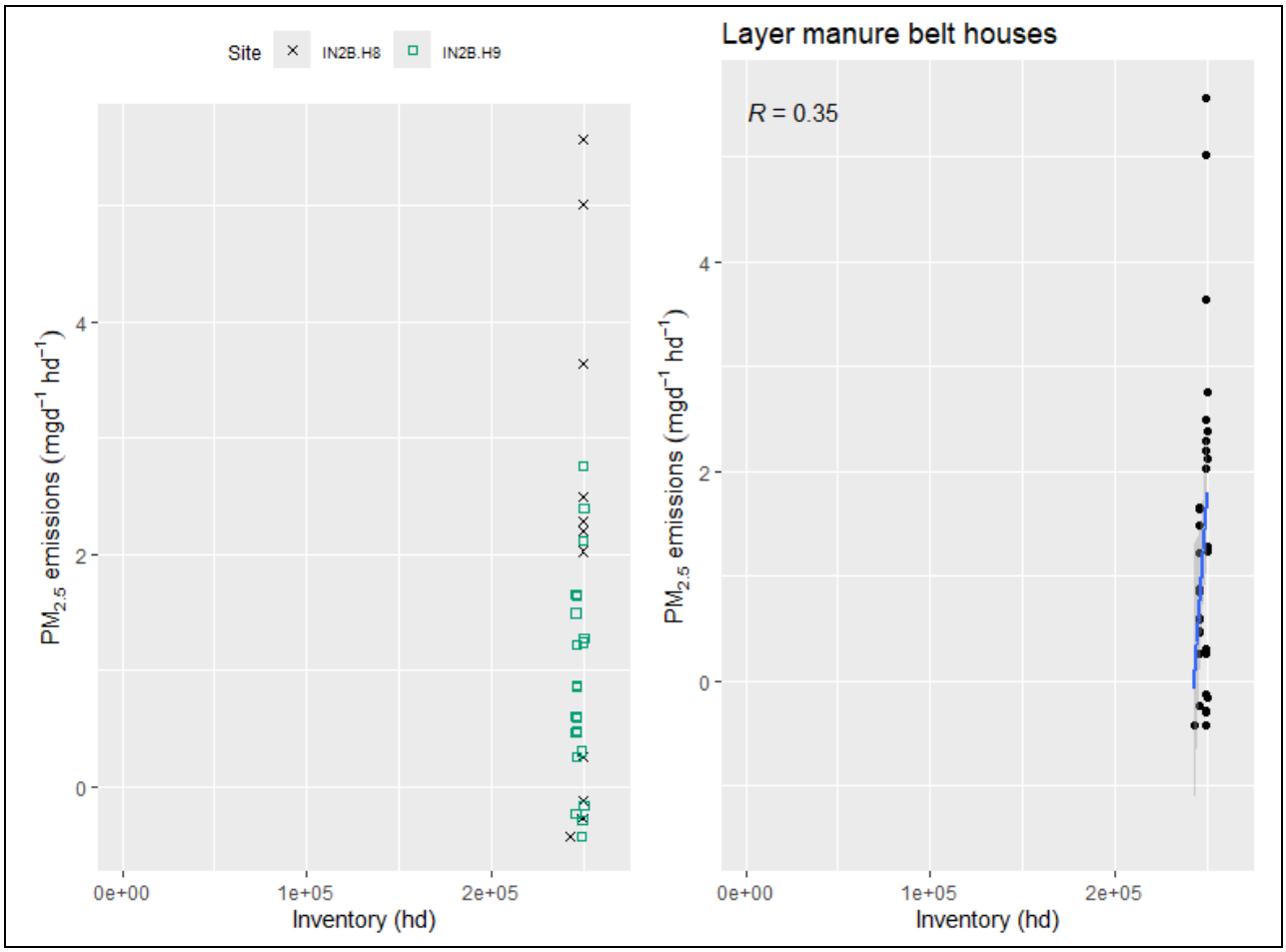

Figure 2.38: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

2.1.4.2 *Average animal weight*

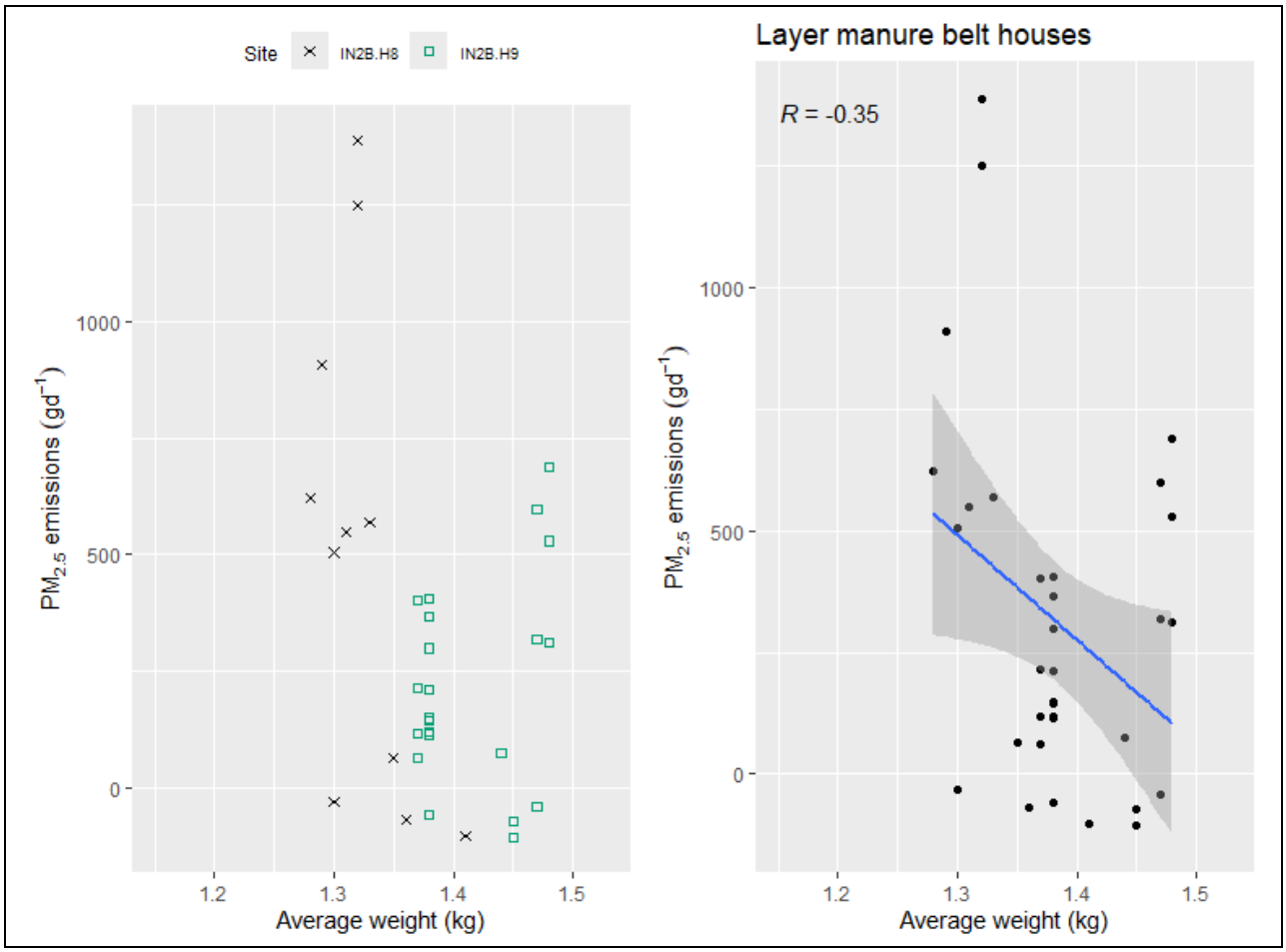

Figure 2.39: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus average animal weight.

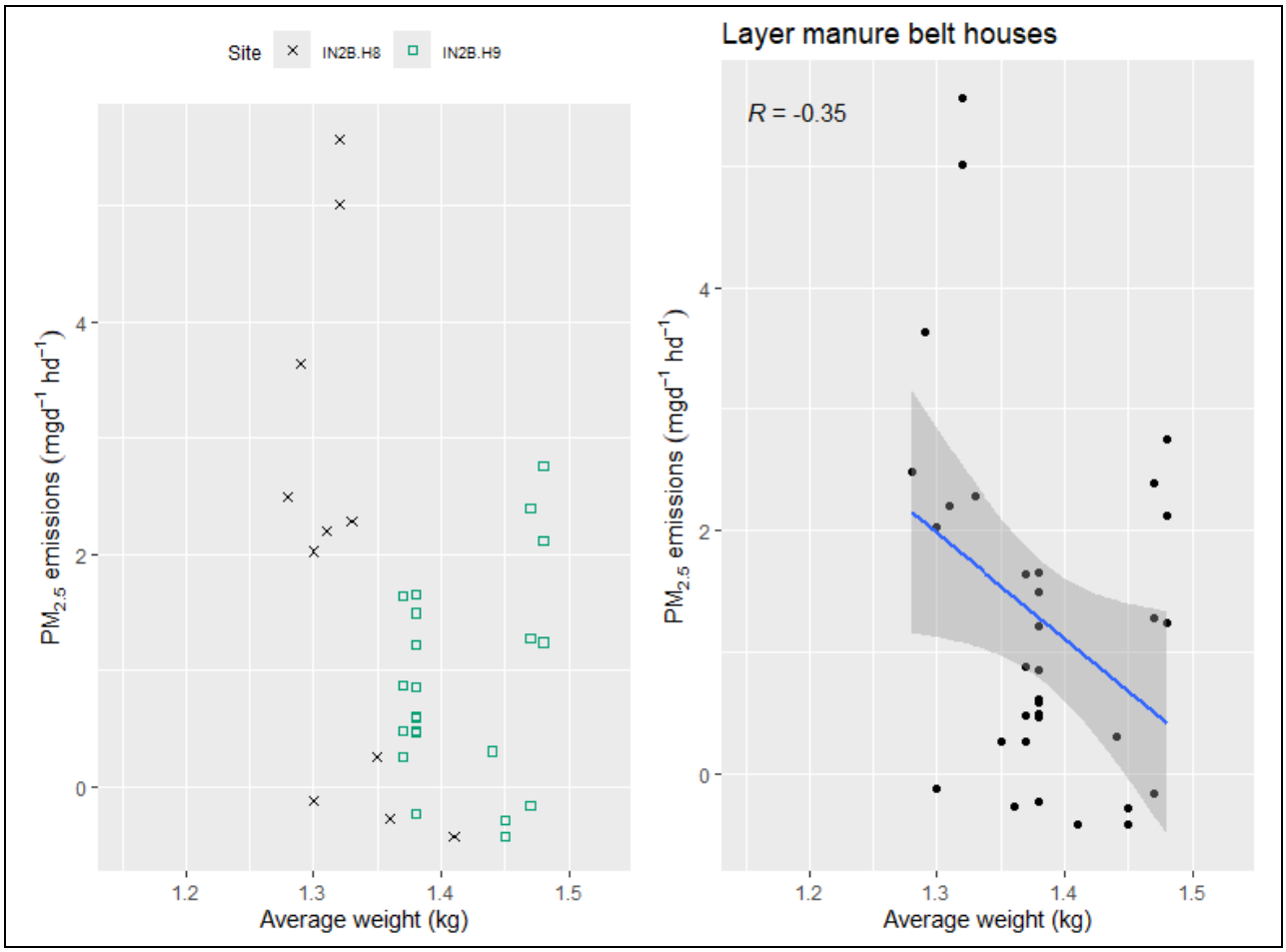

Figure 2.40: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

2.1.4.3 *Live animal weight*

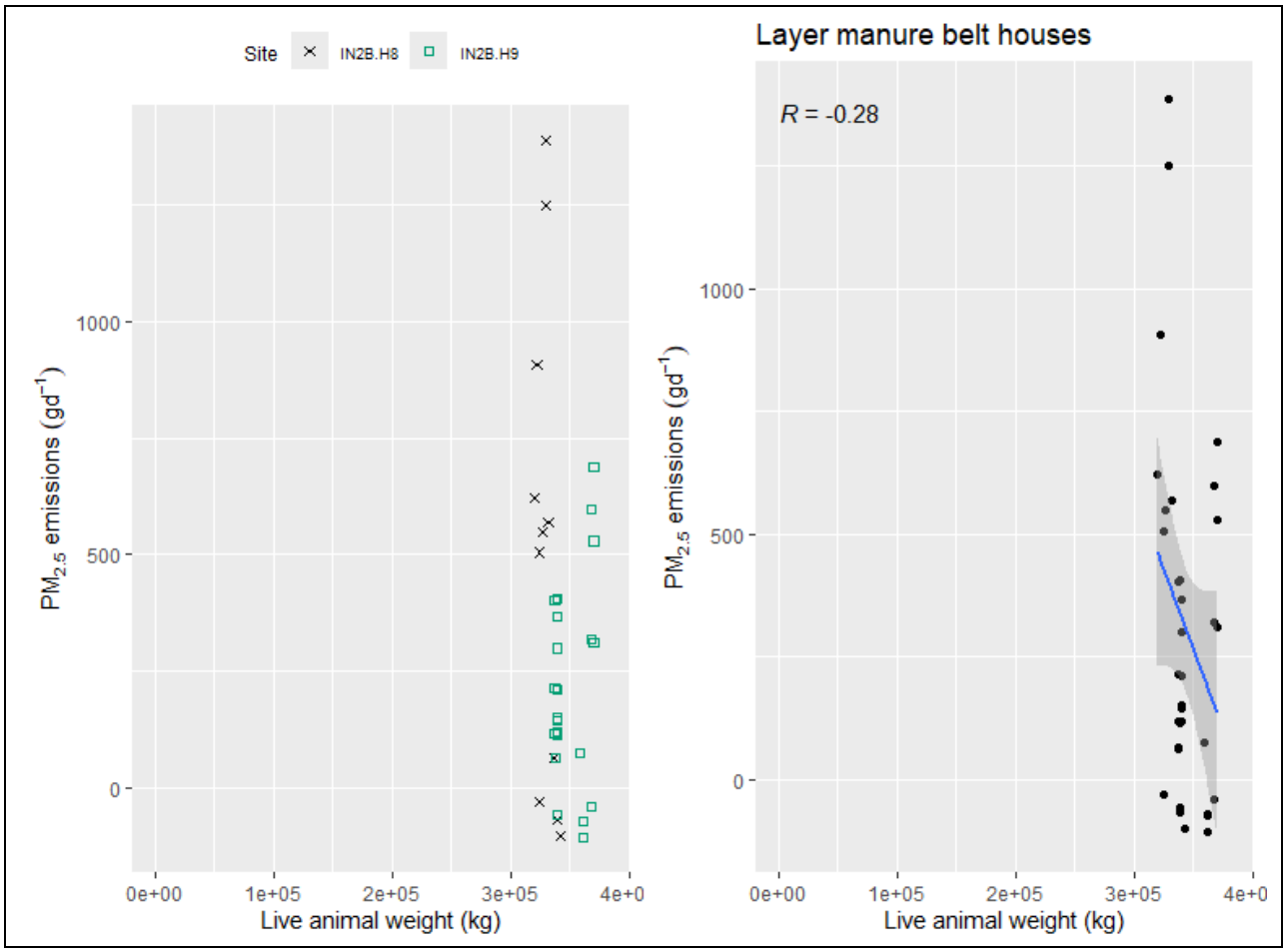

Figure 2.41: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus live animal weight.

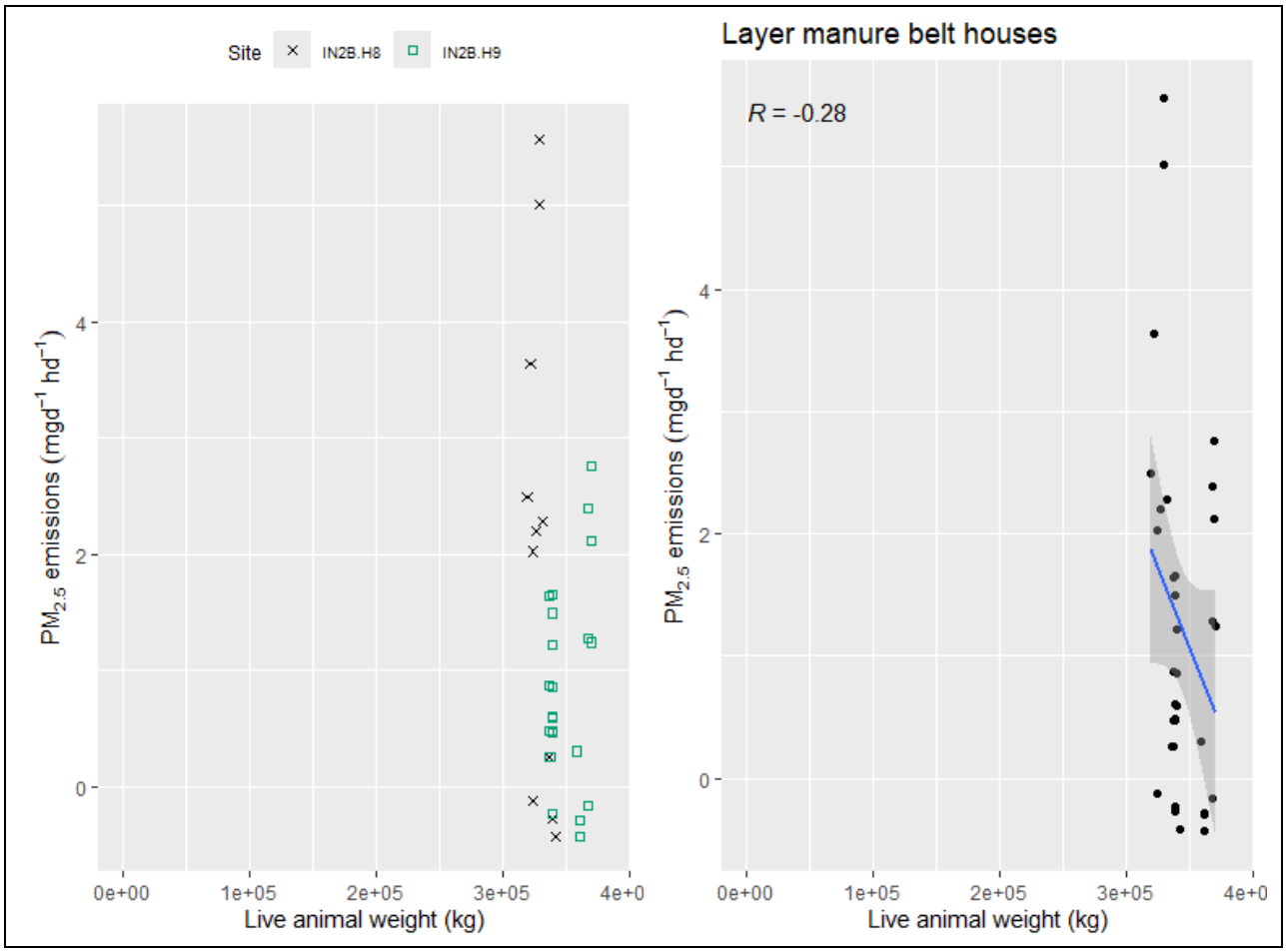

Figure 2.42: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

2.1.4.4 *Exhaust temperature*

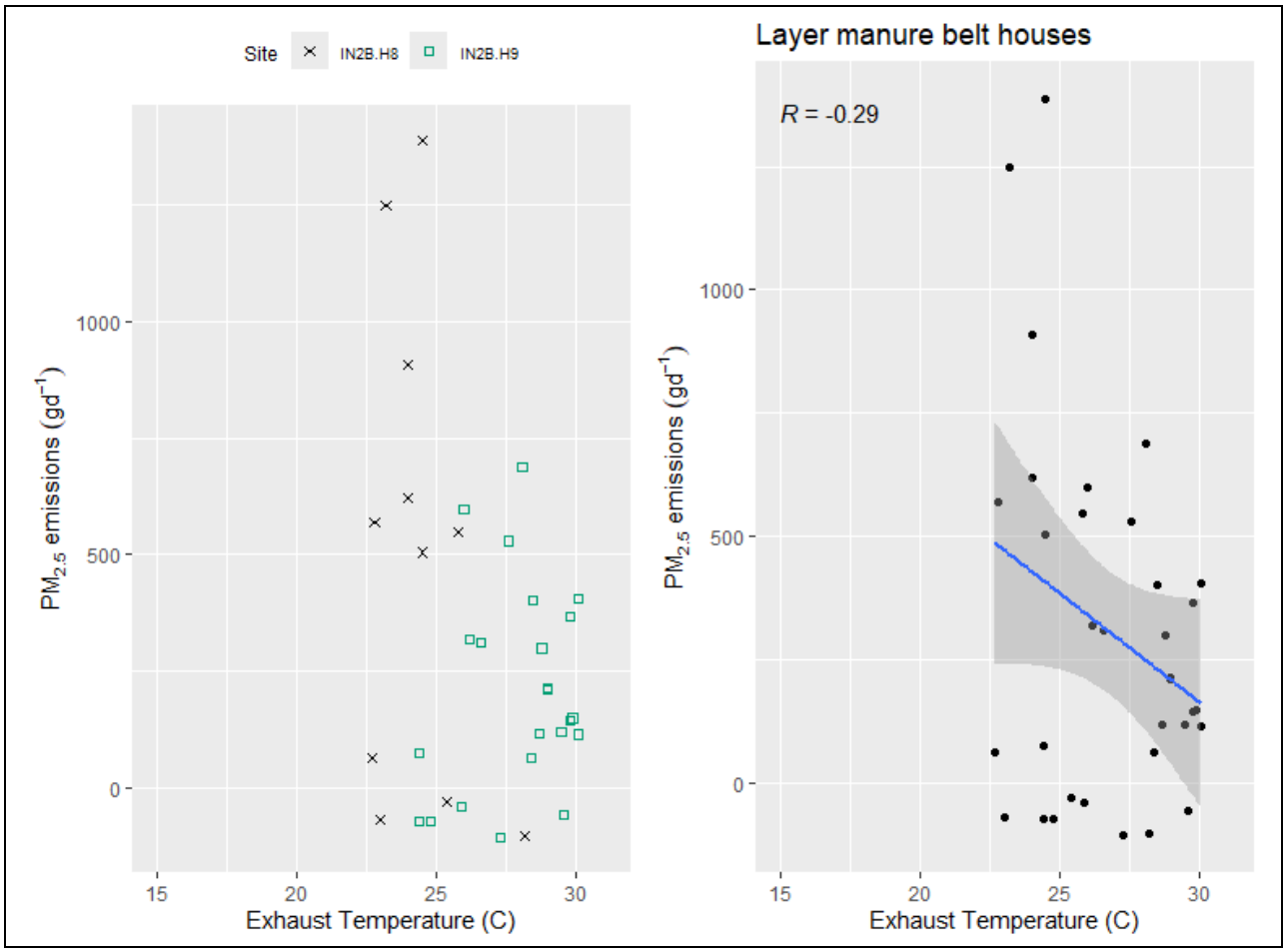

Figure 2.43: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus exhaust temperature.

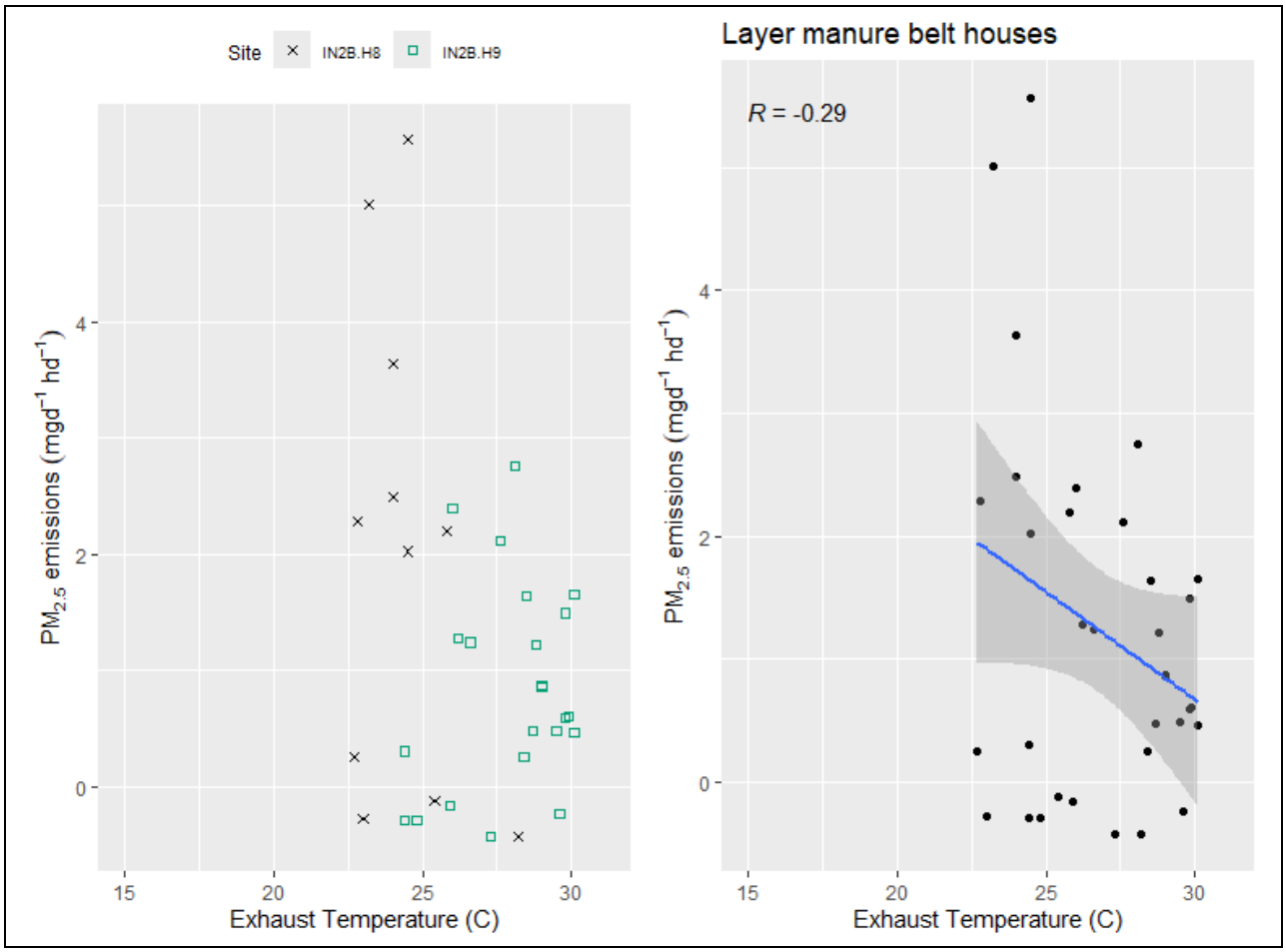

Figure 2.44: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

2.1.4.5 Exhaust relative humidity

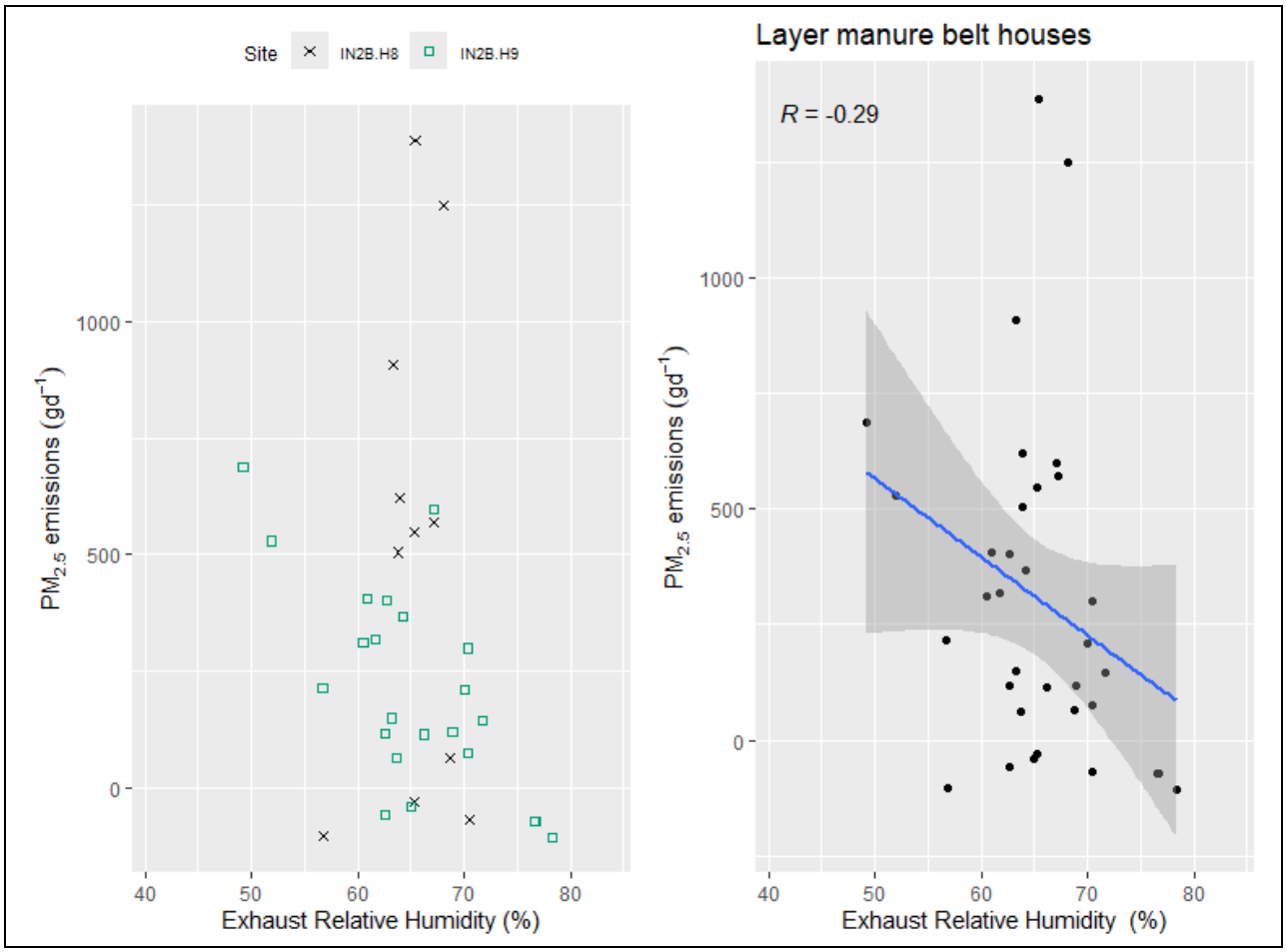

Figure 2.45: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus exhaust relative humidity.

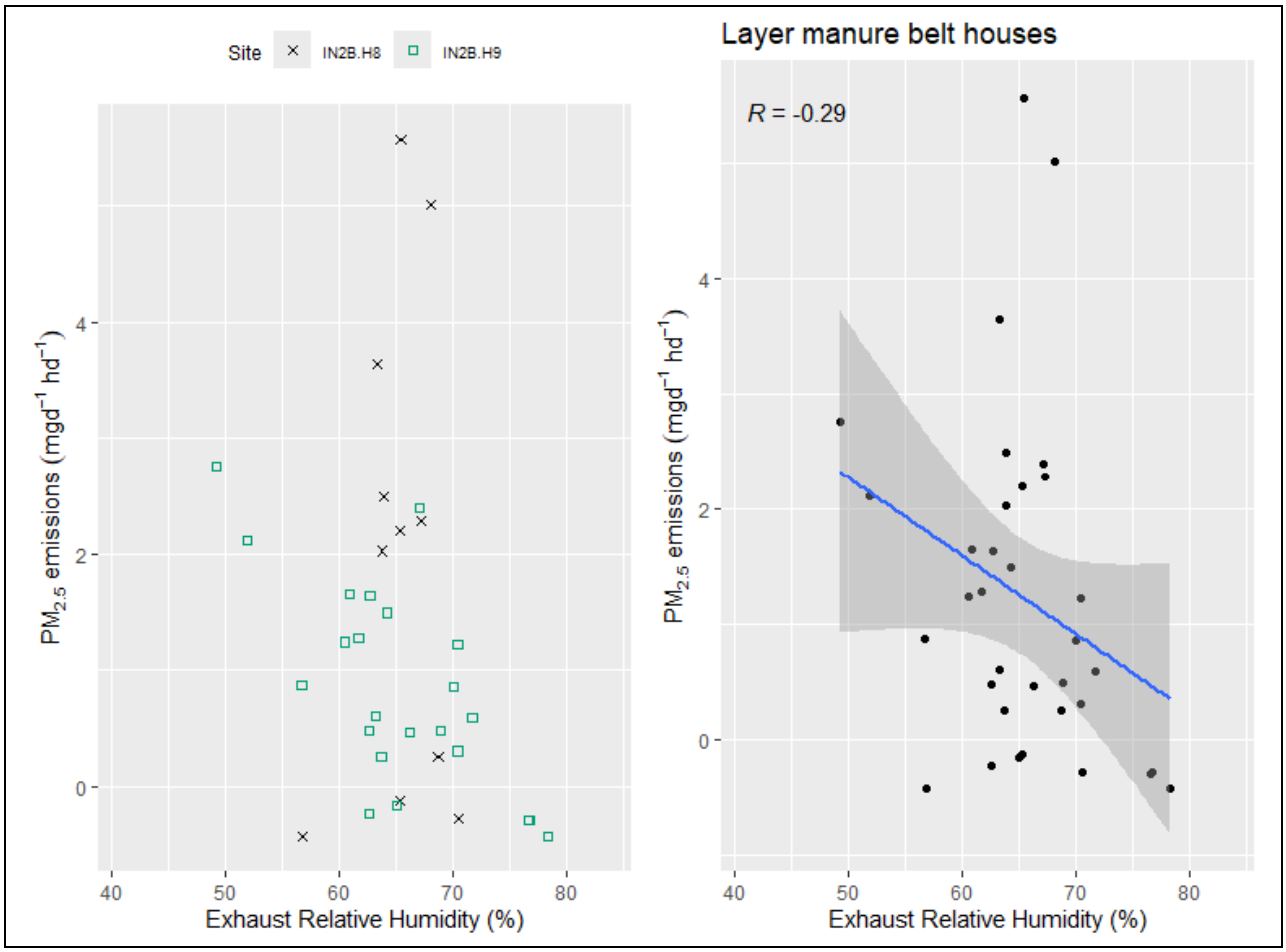

Figure 2.46: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

2.1.4.6 *Airflow*

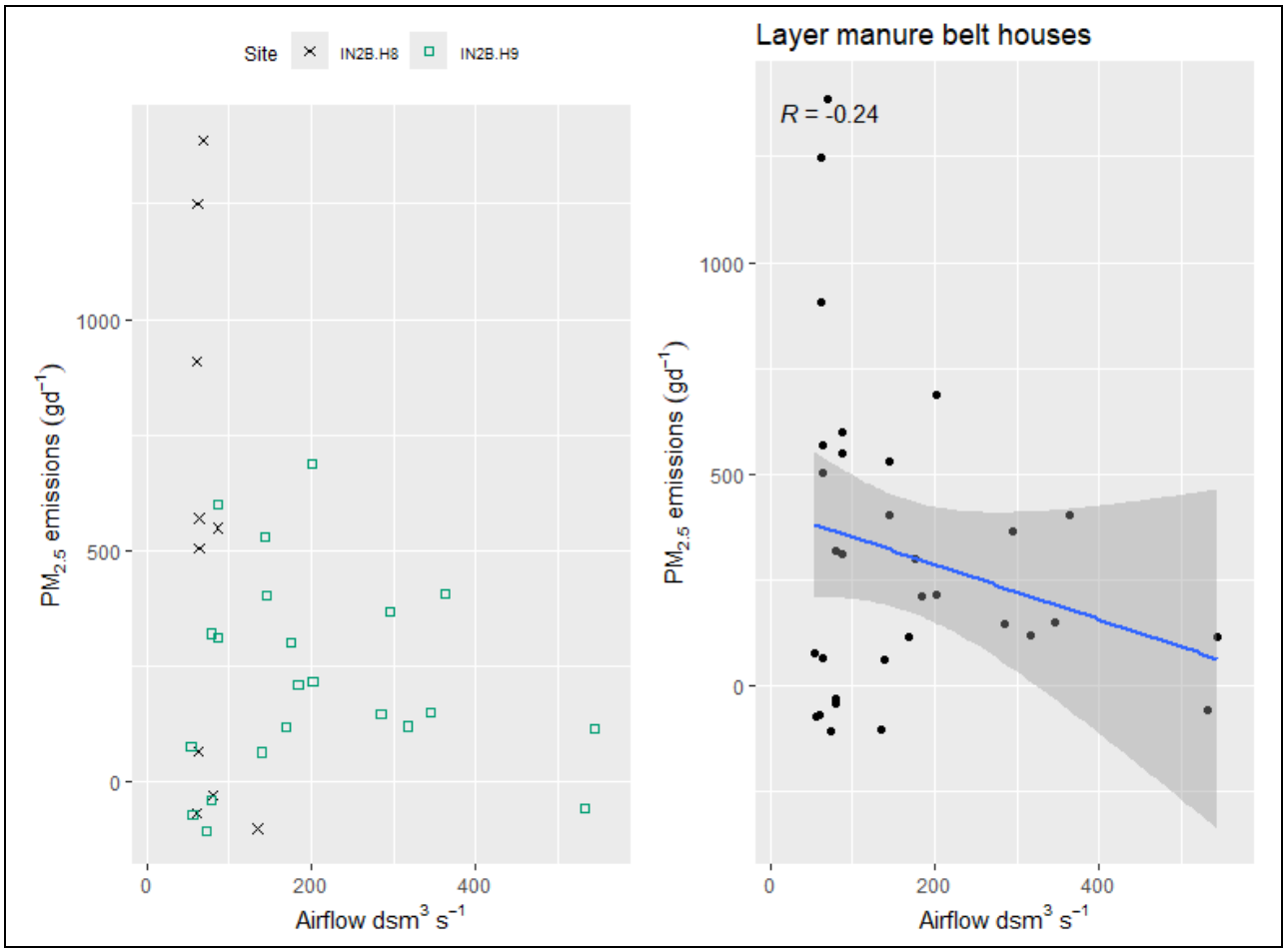

Figure 2.47: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus airflow.

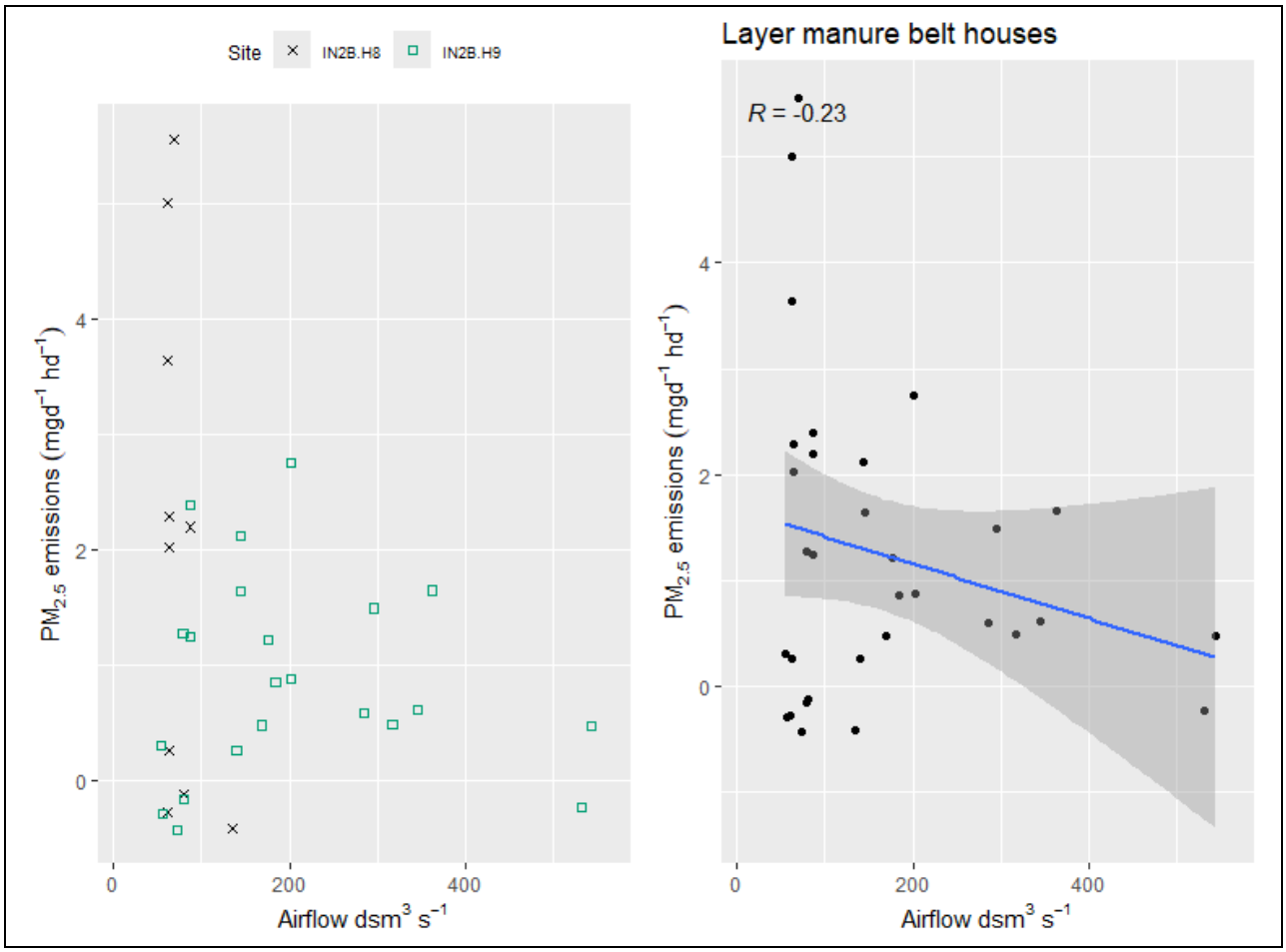

Figure 2.48: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus airflow.

2.1.5 Total Suspended Particulates (TSP)

2.1.5.1 Inventory

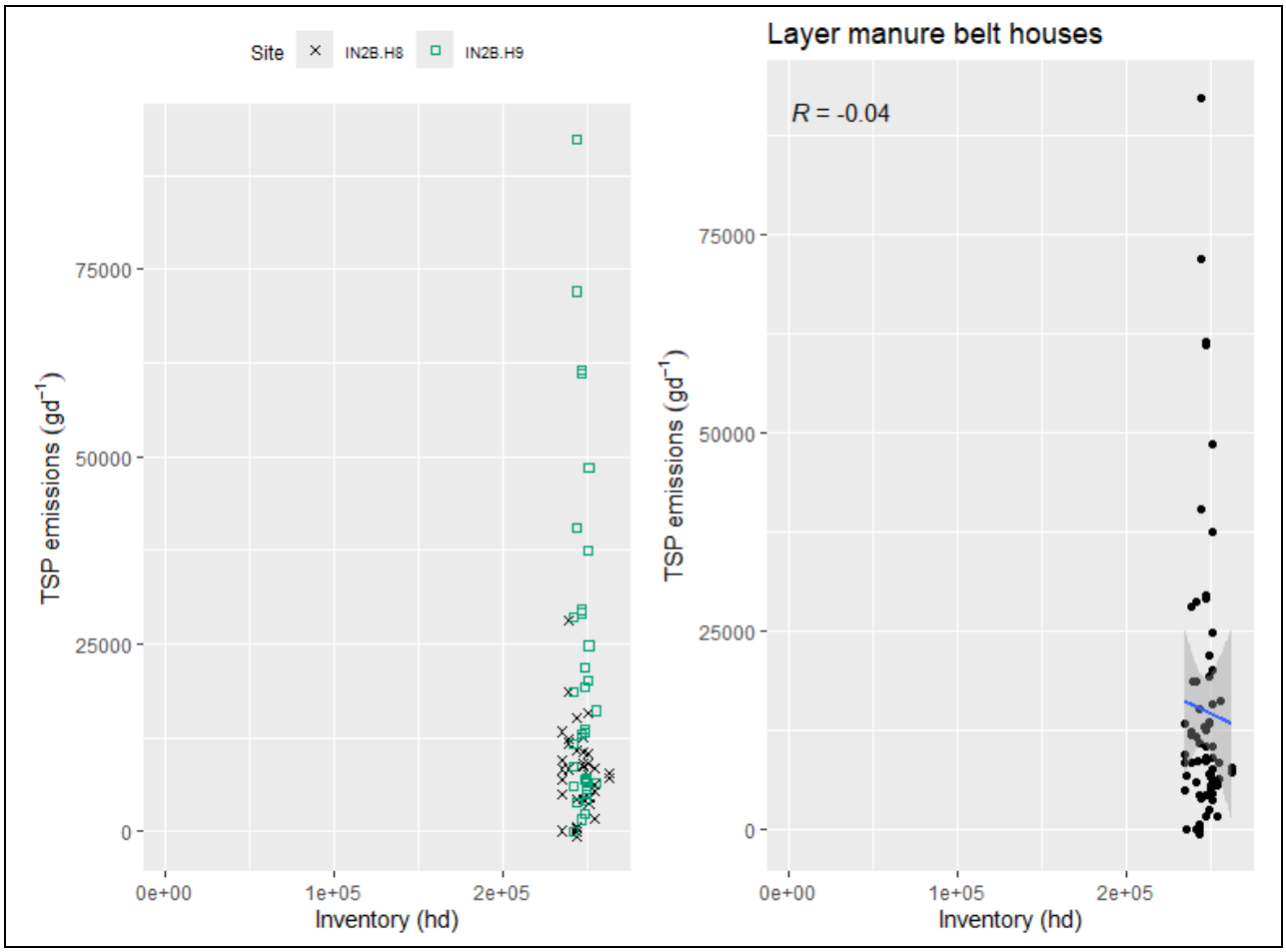

Figure 2.49: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus Inventory.

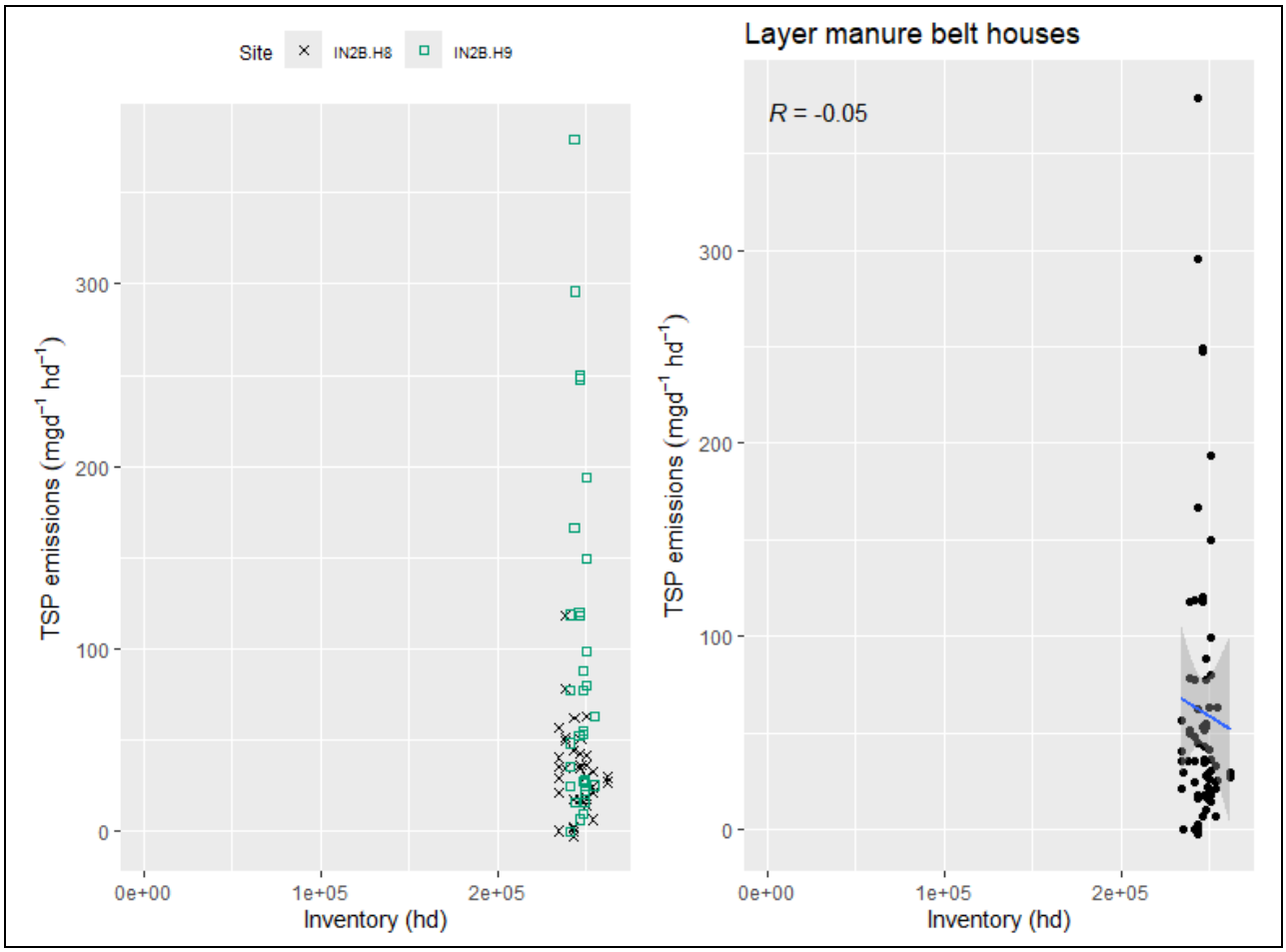

Figure 2.50: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

2.1.5.2 Average animal weight

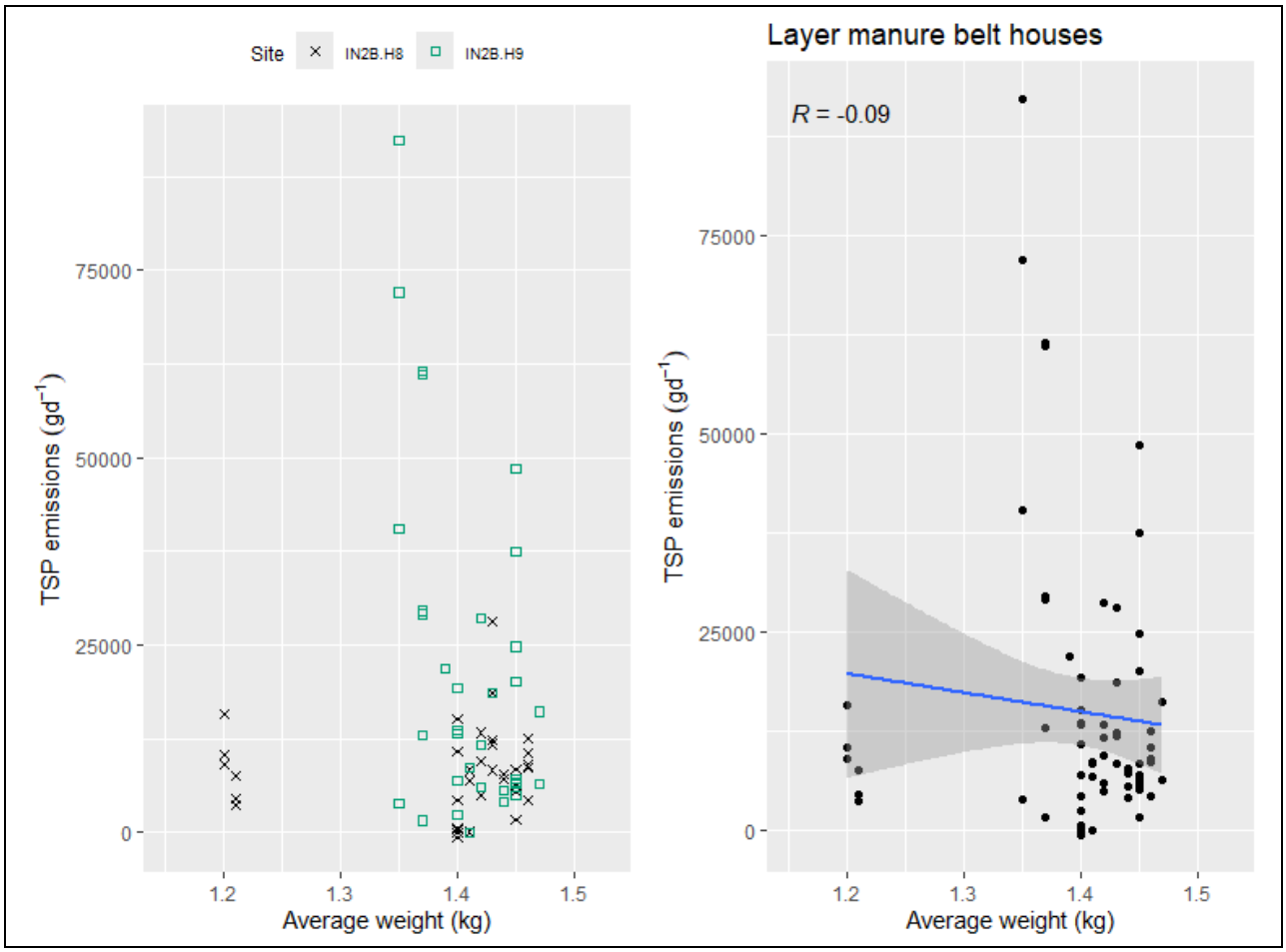

Figure 2.51: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus average animal weight.

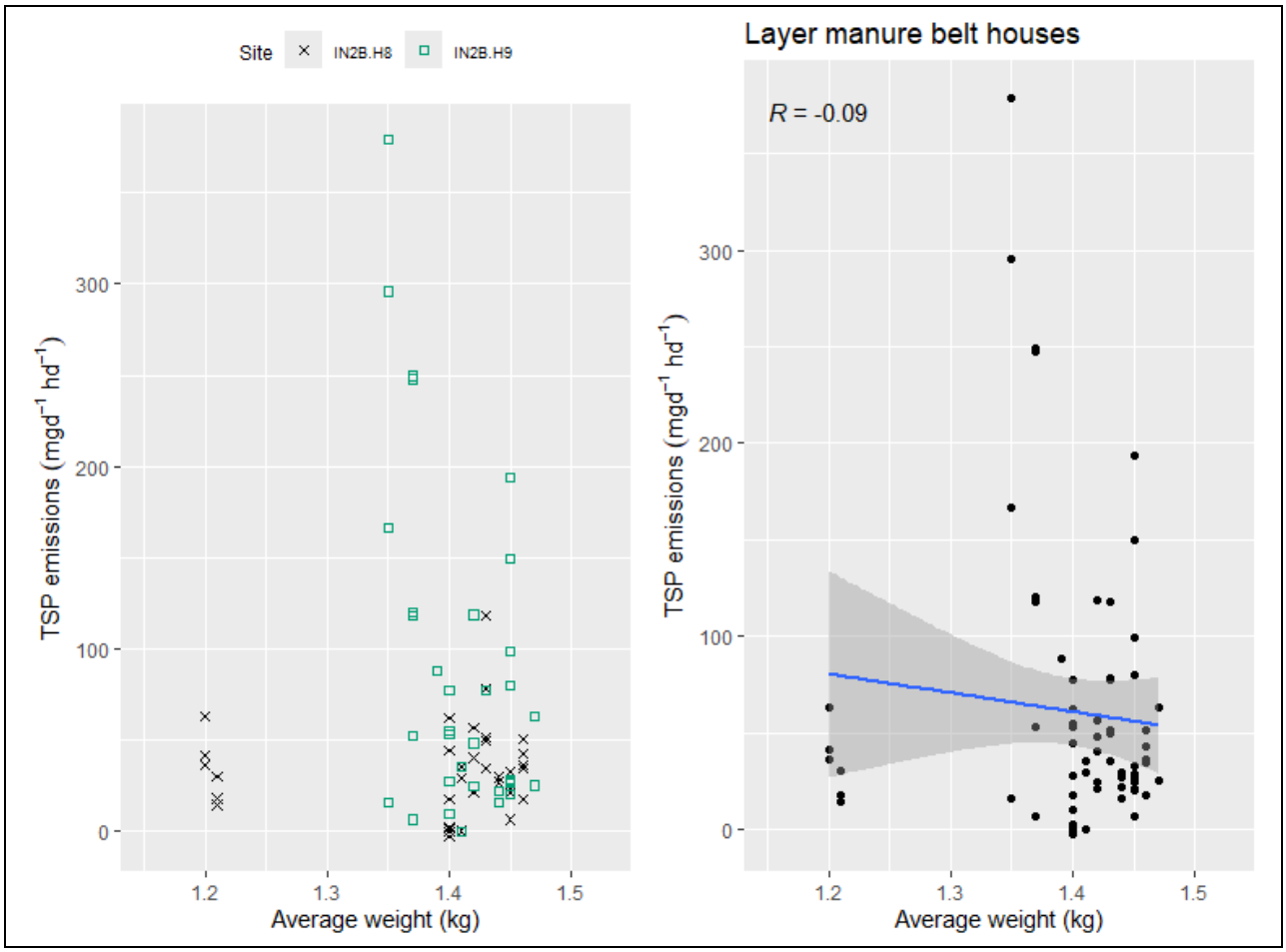

Figure 2.52: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

2.1.5.3 *Live animal weight*

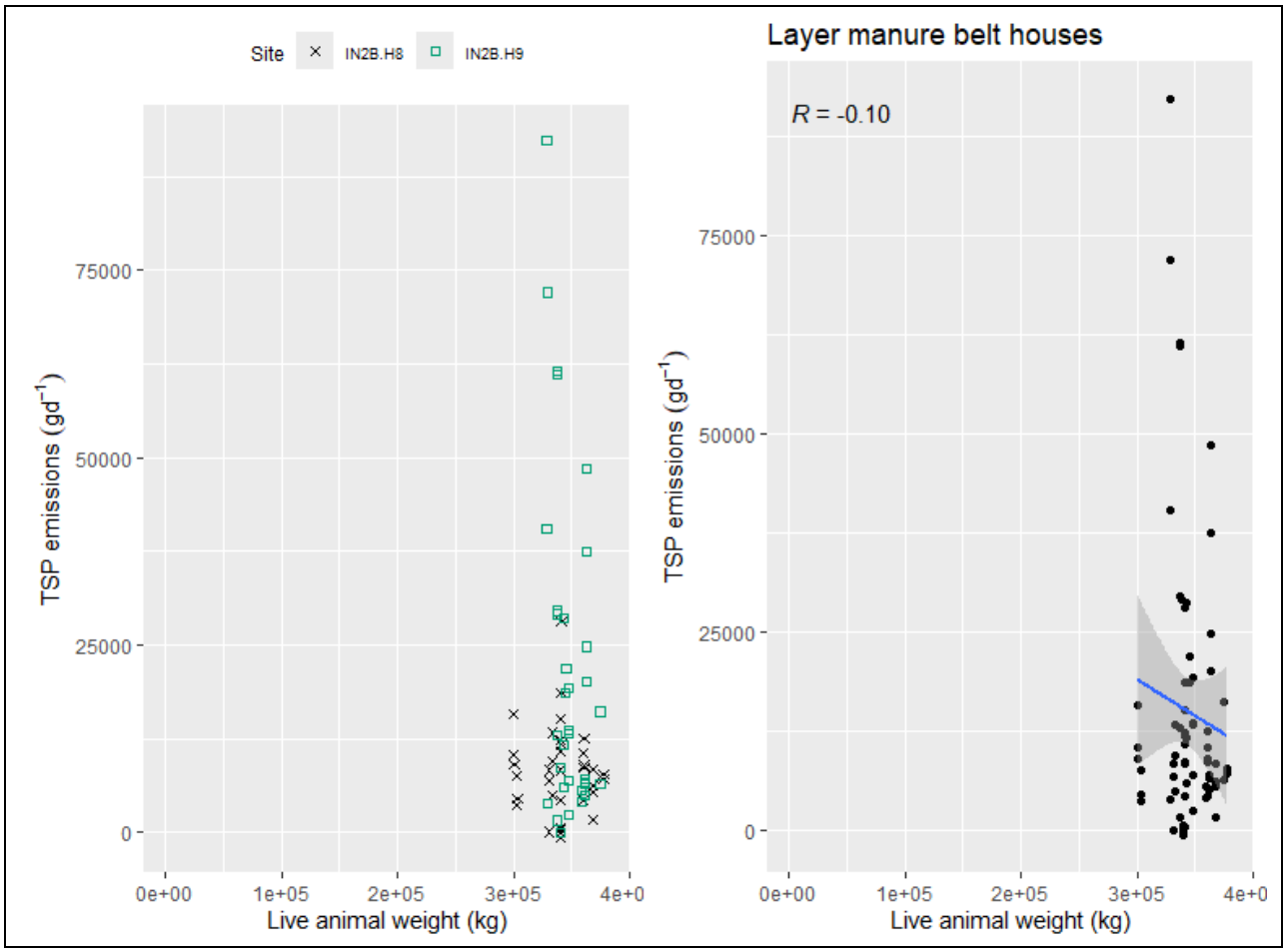

Figure 2.53: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus live animal weight.

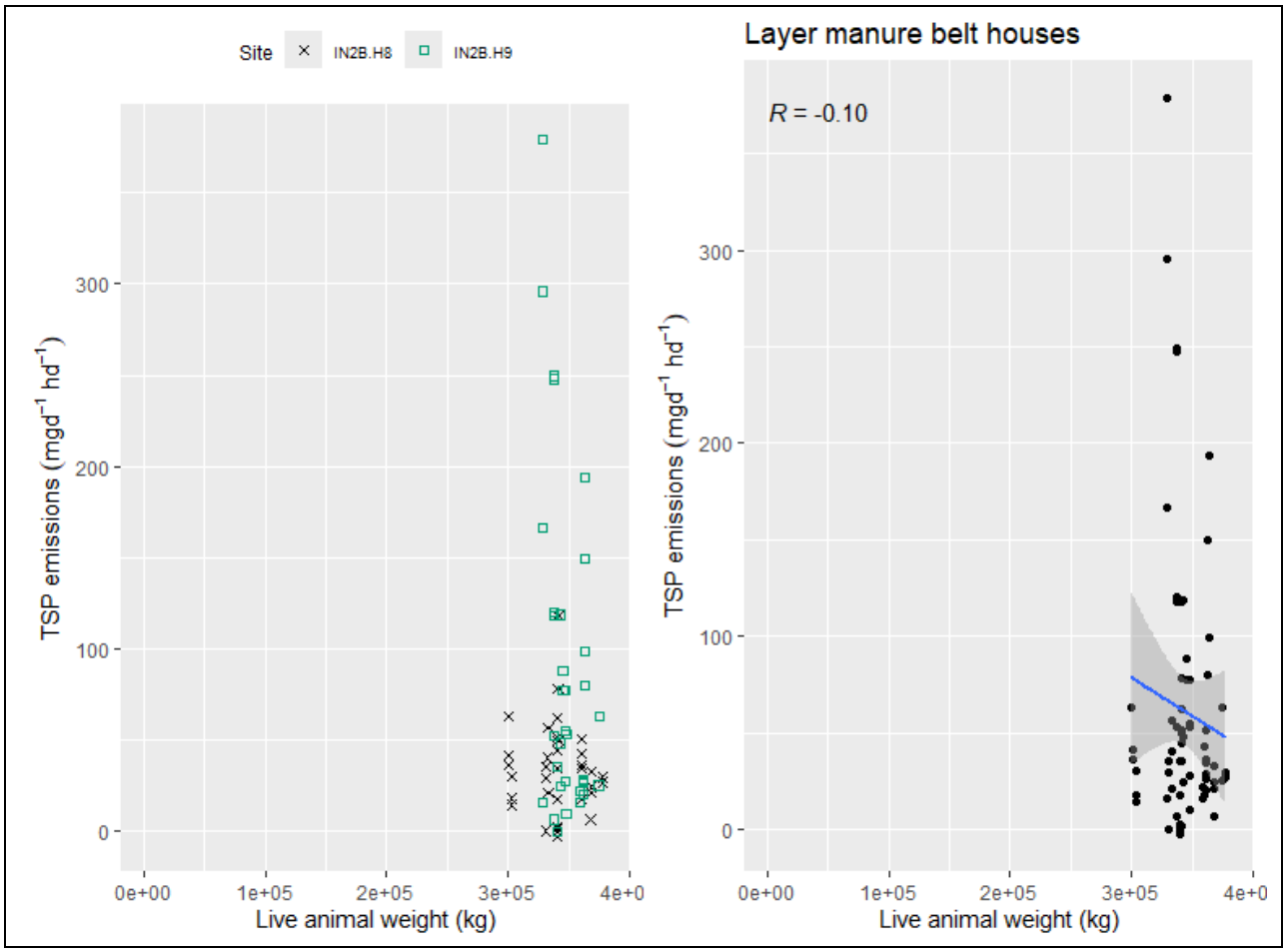

Figure 2.54: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

2.1.5.4 *Exhaust temperature*

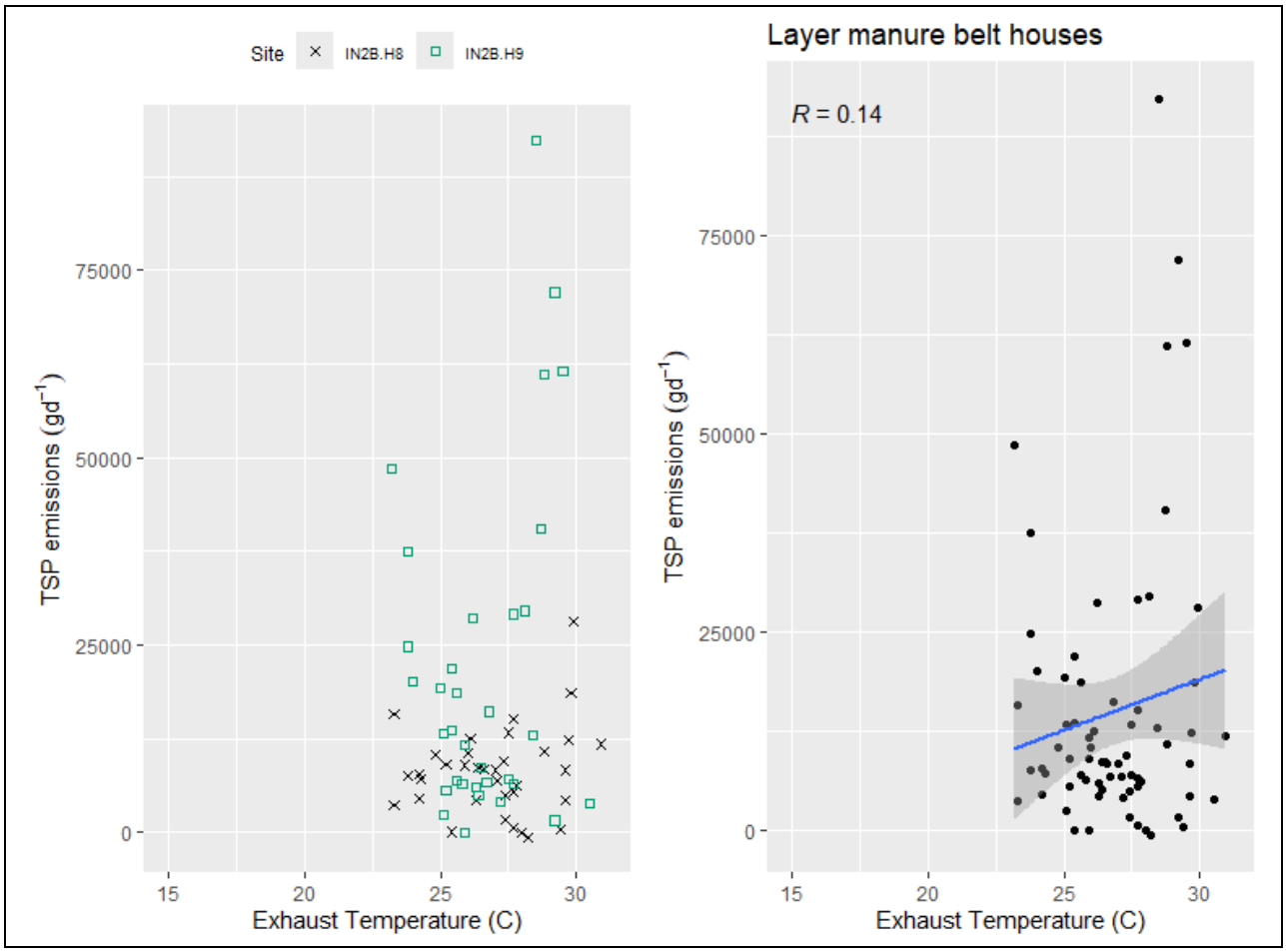

Figure 2.55: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus exhaust temperature.

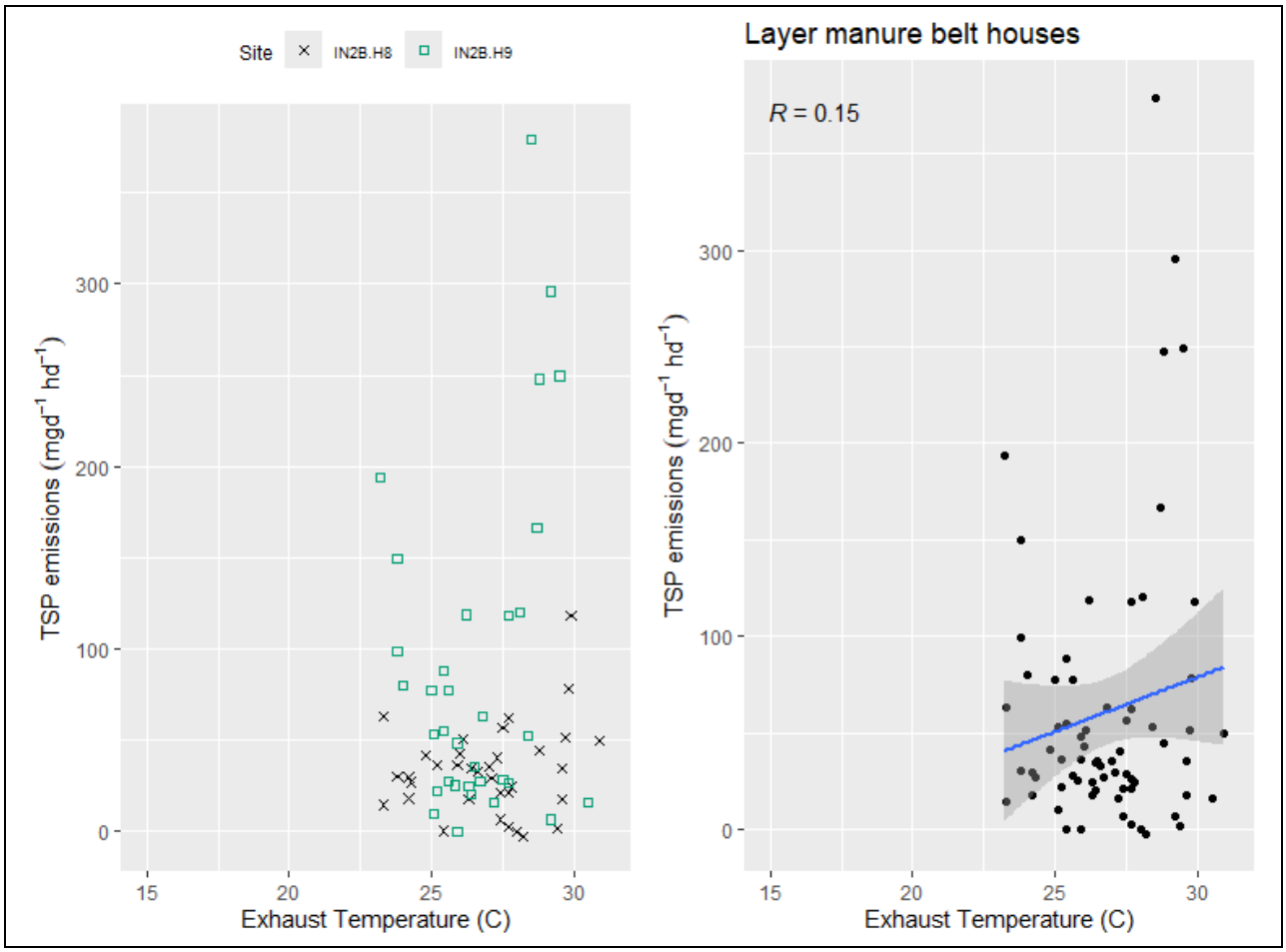

Figure 2.56: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus exhaust temperature.

2.1.5.5 Exhaust relative humidity

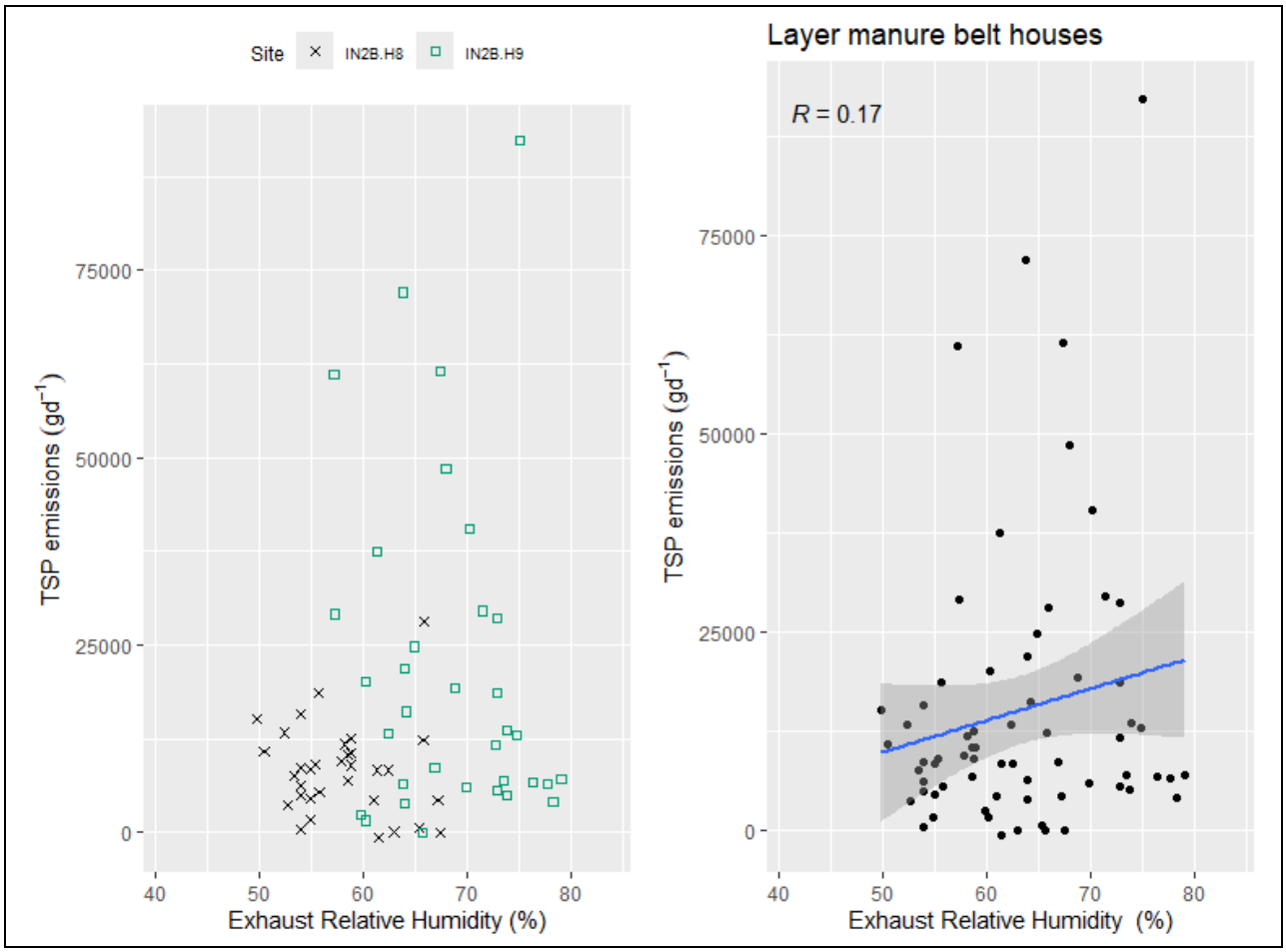

Figure 2.57: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus exhaust relative humidity.

Figure 2.58: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus exhaust relative humidity.

2.1.5.6 *Airflow*

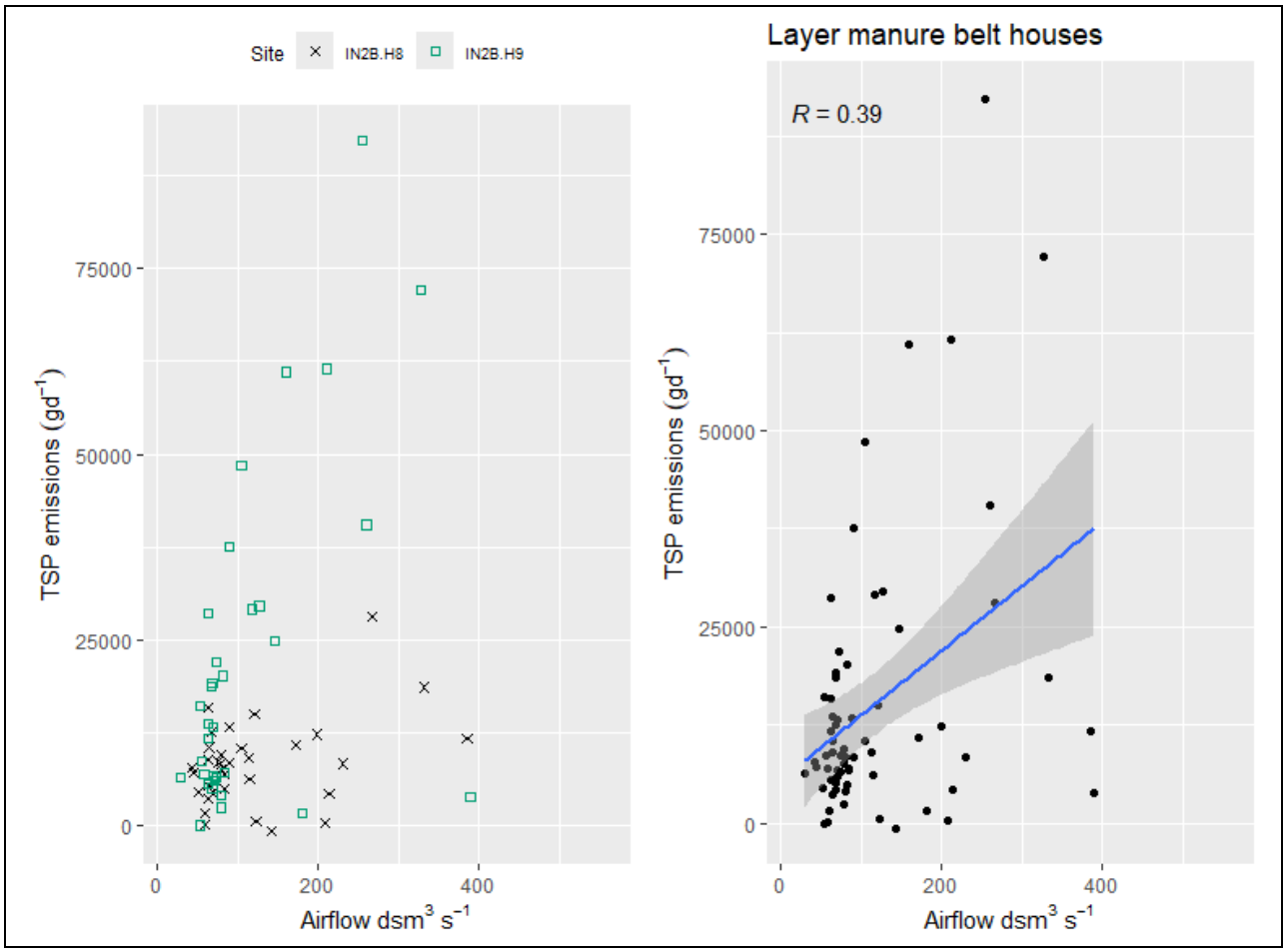

Figure 2.59: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus airflow.

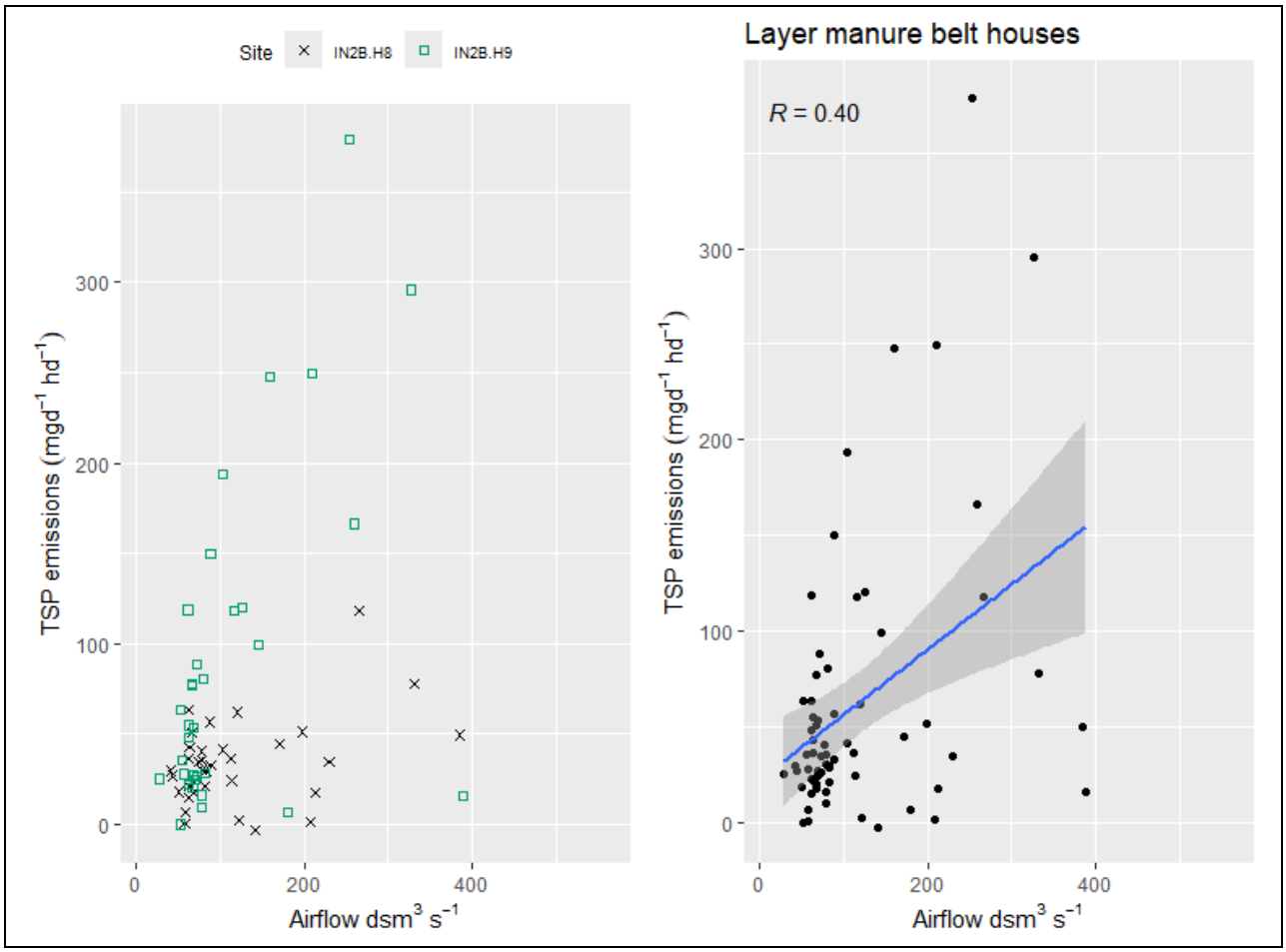

Figure 2.60: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus airflow.

2.2 Ambient

Table 2.2: Summary of layer manure belt houses R^{-2} values for ambient parameters.

Emissions	Parameter	R	R2	Strength
NH_3 (kgd^{-1})	Ambient Temperature (C)	-0.31	0.1	slight or weak
NH_3 ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	-0.21	0.04	slight or weak
NH_3 (kgd^{-1})	Ambient Relative humidity (%)	0.3	0.09	slight or weak
NH_3 ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.19	0.04	slight or weak
H_2S (gd^{-1})	Ambient Temperature (C)	0.13	0.02	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.12	0.01	slight or weak
H_2S (gd^{-1})	Ambient Relative humidity (%)	0.03	0	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.05	0	slight or weak
PM_{10} (gd^{-1})	Ambient Temperature (C)	0.05	0	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.06	0	slight or weak
PM_{10} (gd^{-1})	Ambient Relative humidity (%)	-0.08	0.01	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	-0.08	0.01	slight or weak
$PM_{2.5}$ (gd^{-1})	Ambient Temperature (C)	-0.21	0.04	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	-0.21	0.04	slight or weak
$PM_{2.5}$ (gd^{-1})	Ambient Relative humidity (%)	0.14	0.02	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.14	0.02	slight or weak
TSP (gd^{-1})	Ambient Temperature (C)	0.27	0.07	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.28	0.08	slight or weak
TSP (gd^{-1})	Ambient Relative humidity (%)	-0.16	0.02	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	-0.16	0.03	slight or weak

2.2.1 Ammonia (NH_3)

2.2.1.1 Ambient temperature

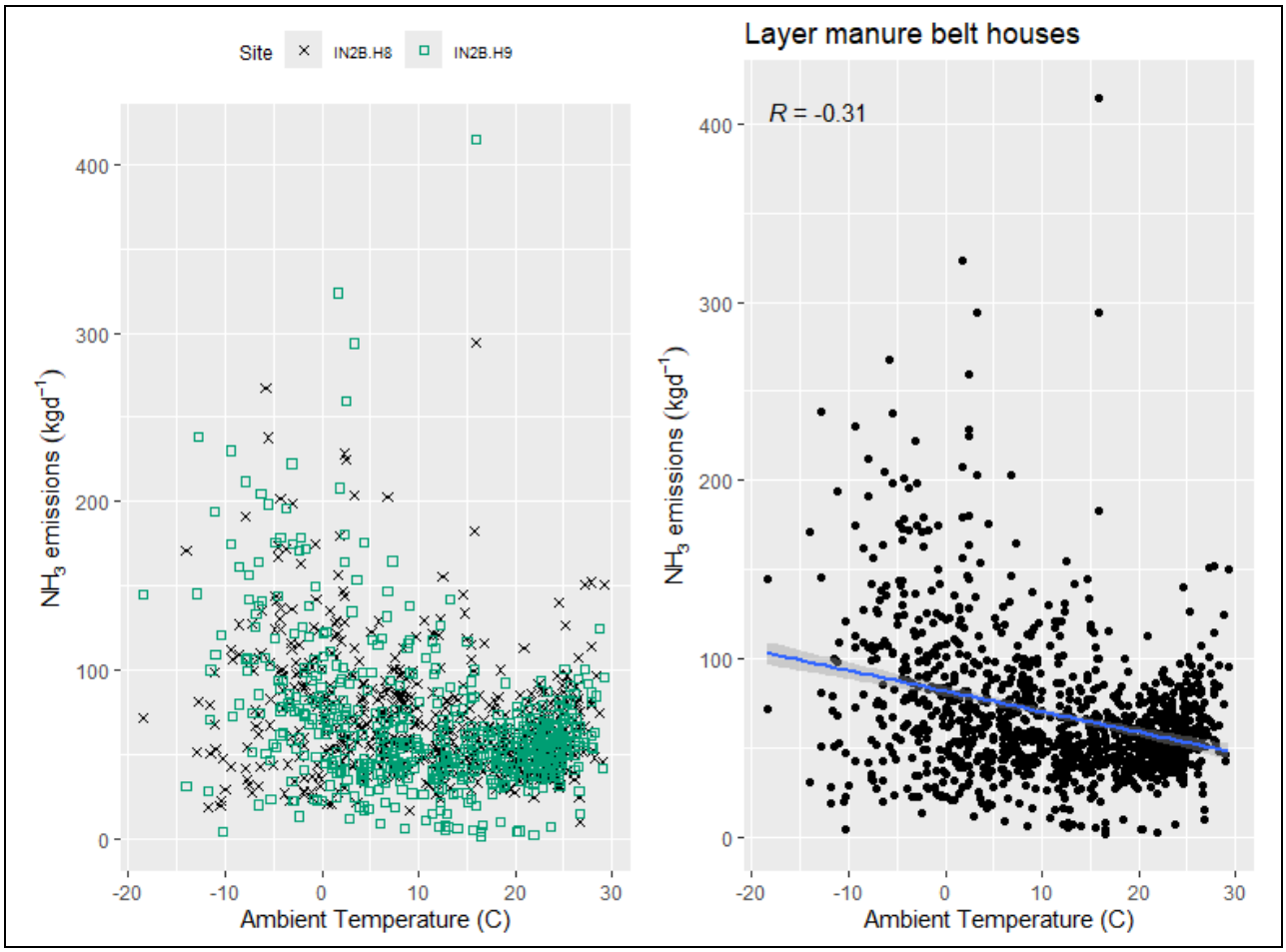

Figure 2.61: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus ambient temperature.

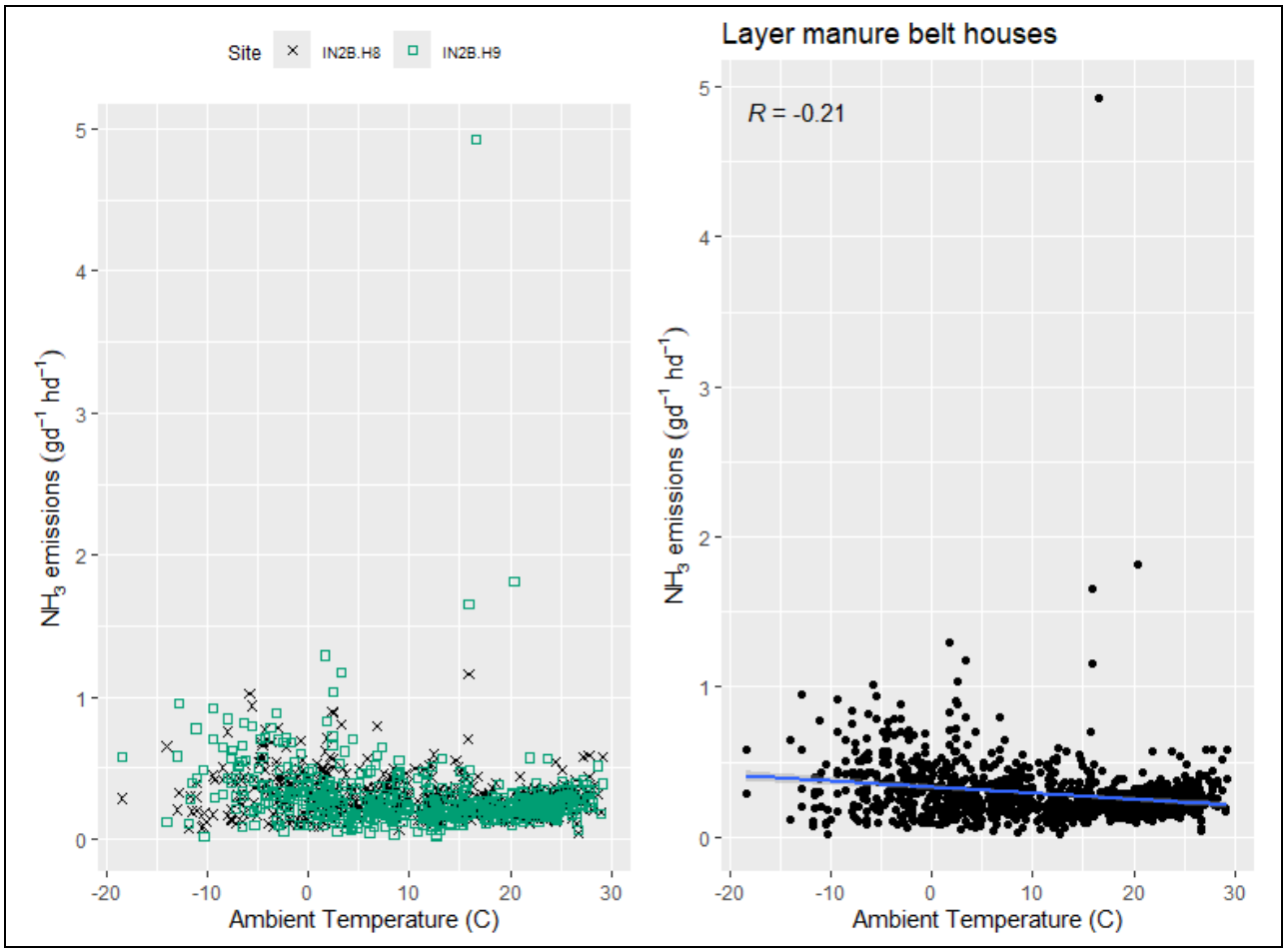

Figure 2.62: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus ambient temperature.

2.2.1.2 *Ambient relative humidity*

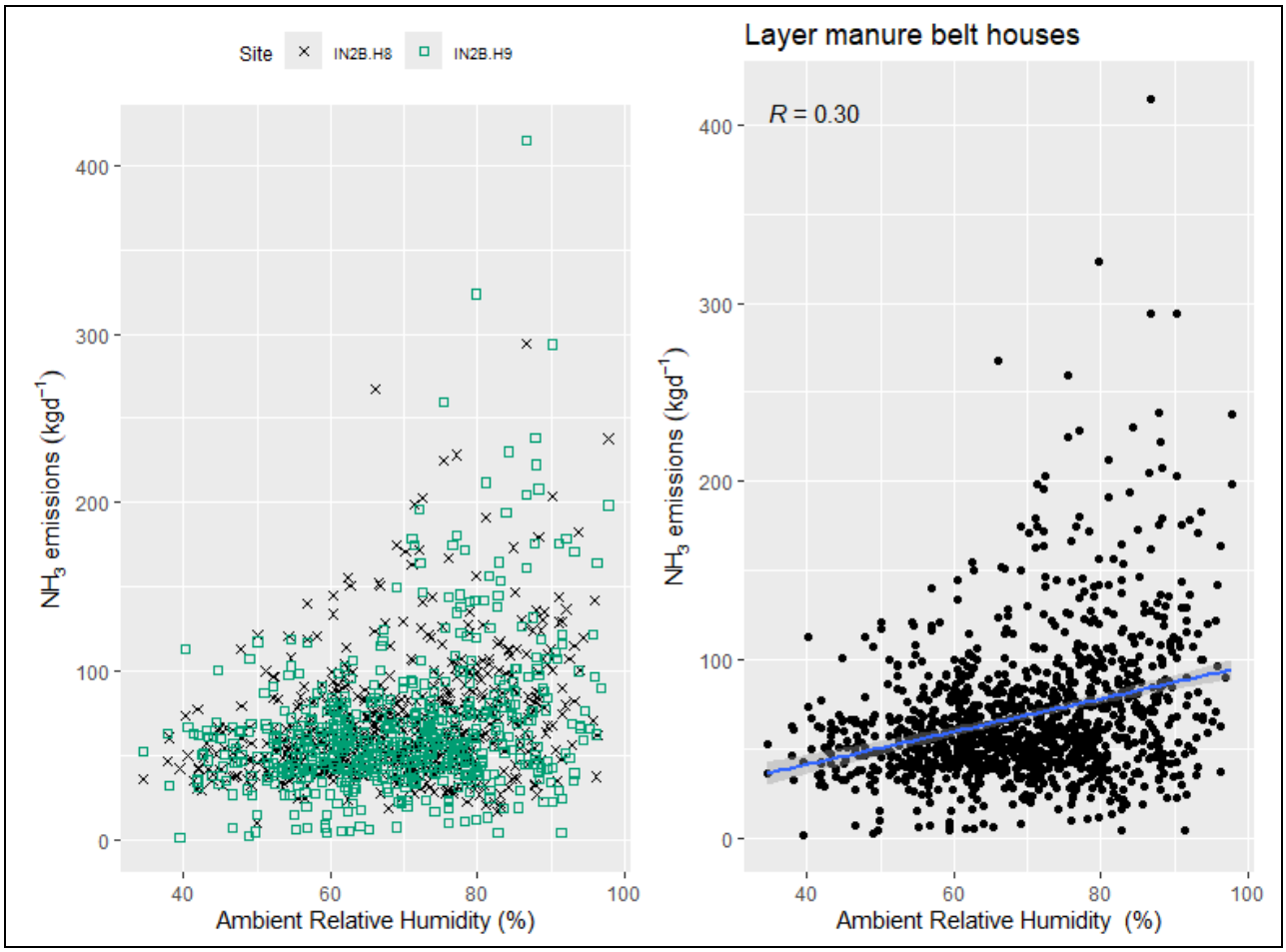

Figure 2.63: Scatter plot of layer manure belt houses NH_3 emissions (kg d^{-1}) versus ambient relative humidity.

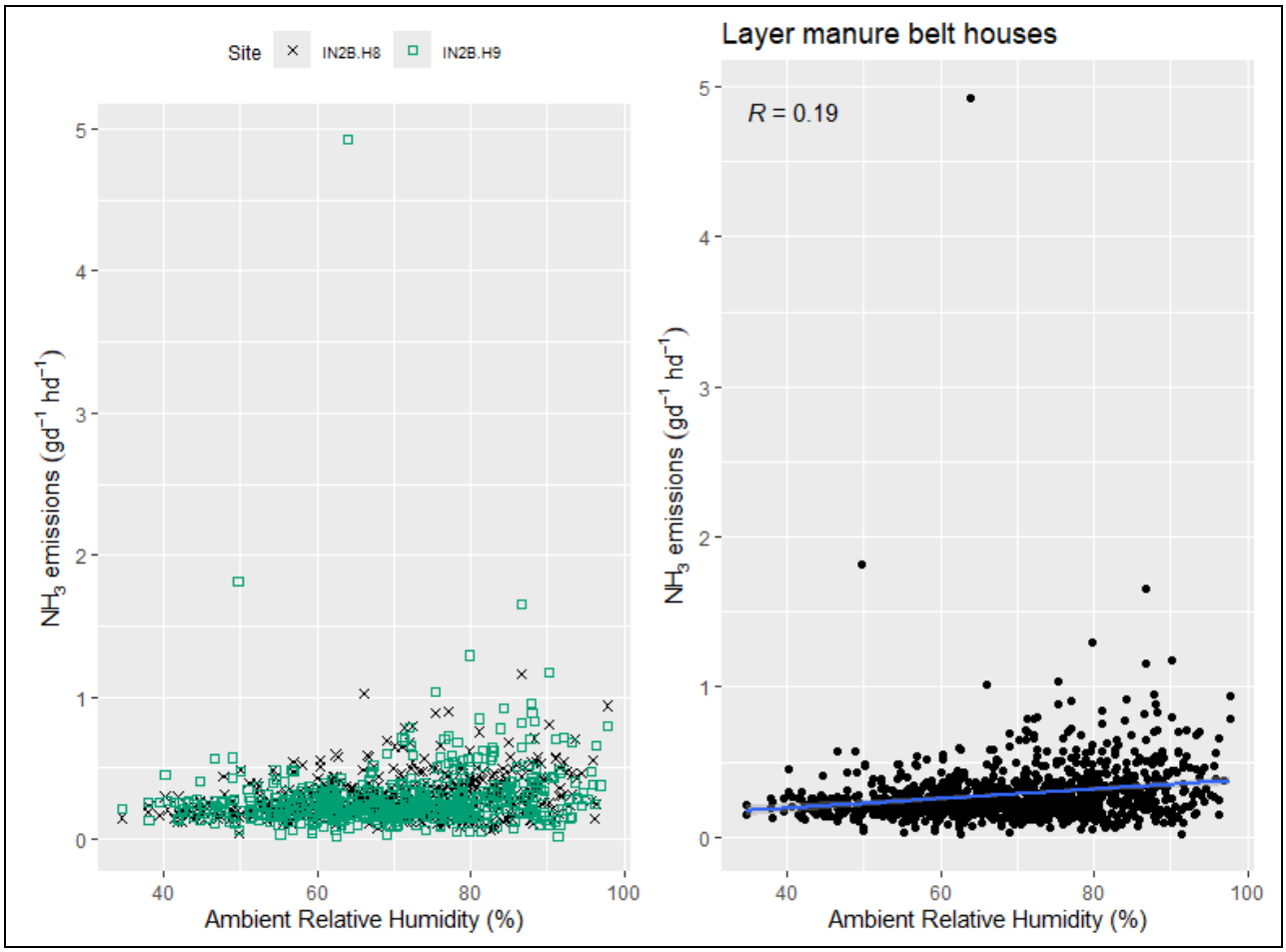

Figure 2.64: Scatter plot of layer manure belt houses NH_3 emissions (g $d^{-1}hd^{-1}$) versus ambient relative humidity.

2.2.2 Hydrogen Sulfide (H_2S)

2.2.2.1 Ambient temperature

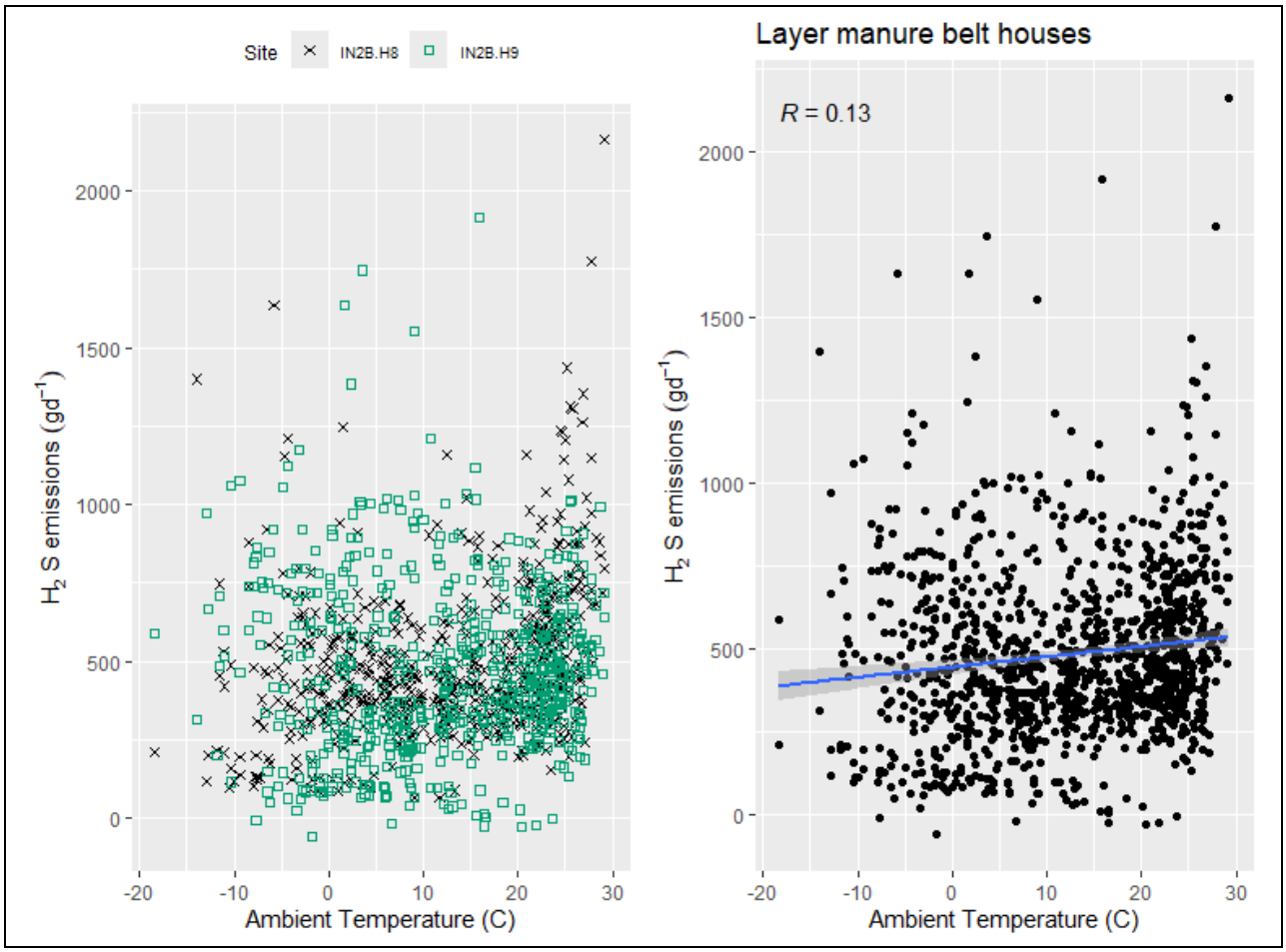

Figure 2.65: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus ambient temperature.

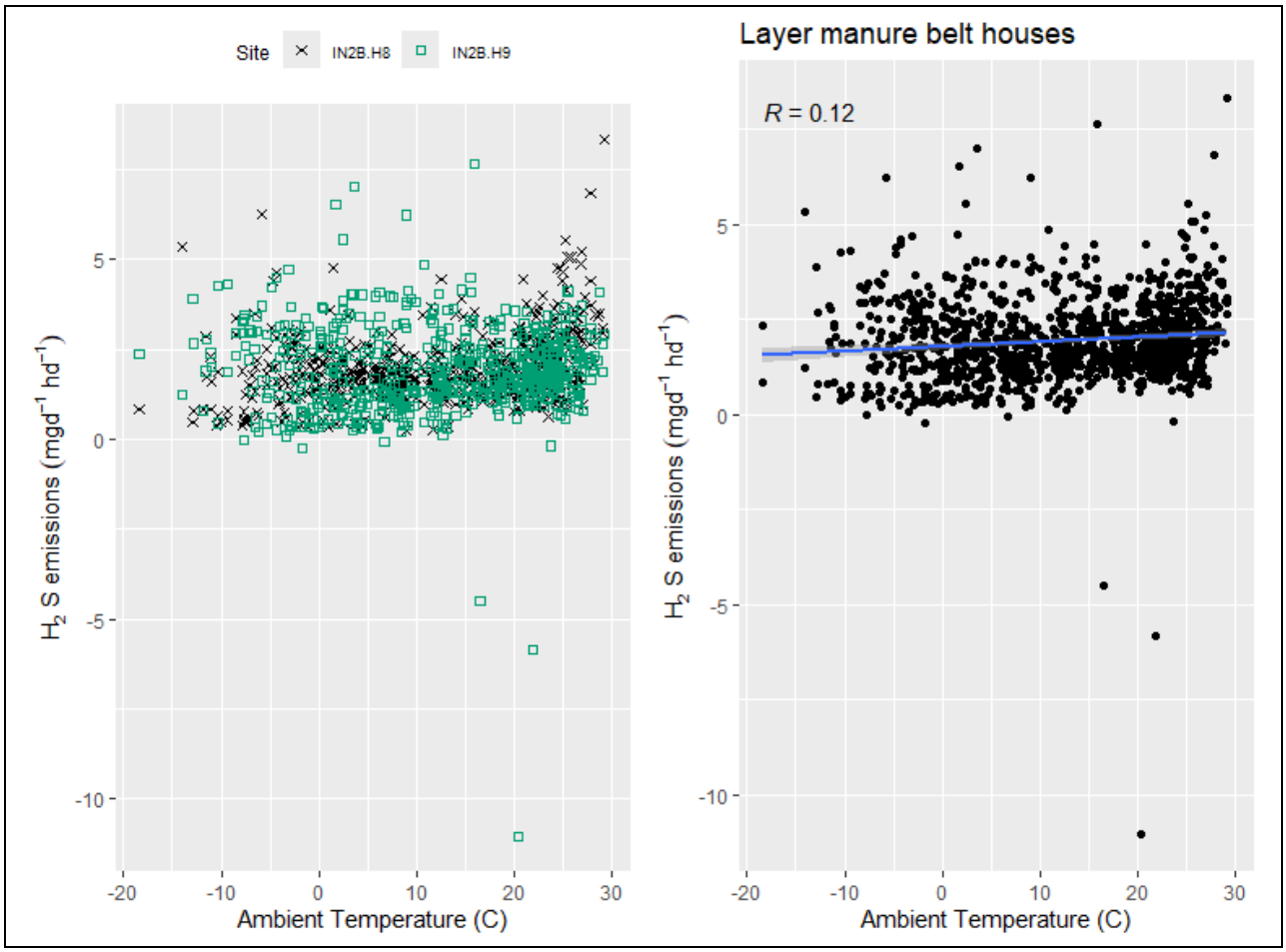

Figure 2.66: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

2.2.2.2 *Ambient relative humidity*

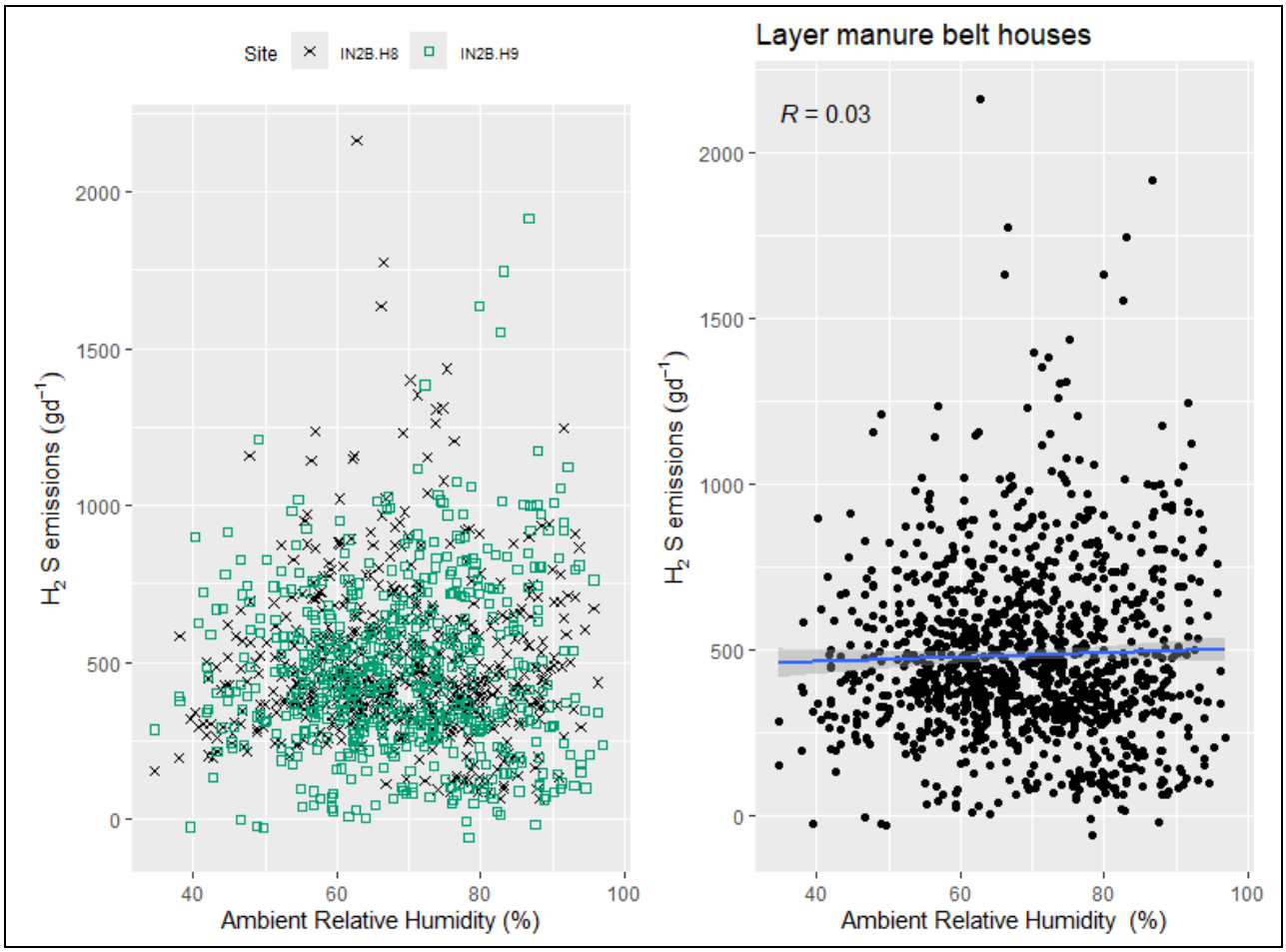

Figure 2.67: Scatter plot of layer manure belt houses H_2S emissions (g d^{-1}) versus ambient relative humidity.

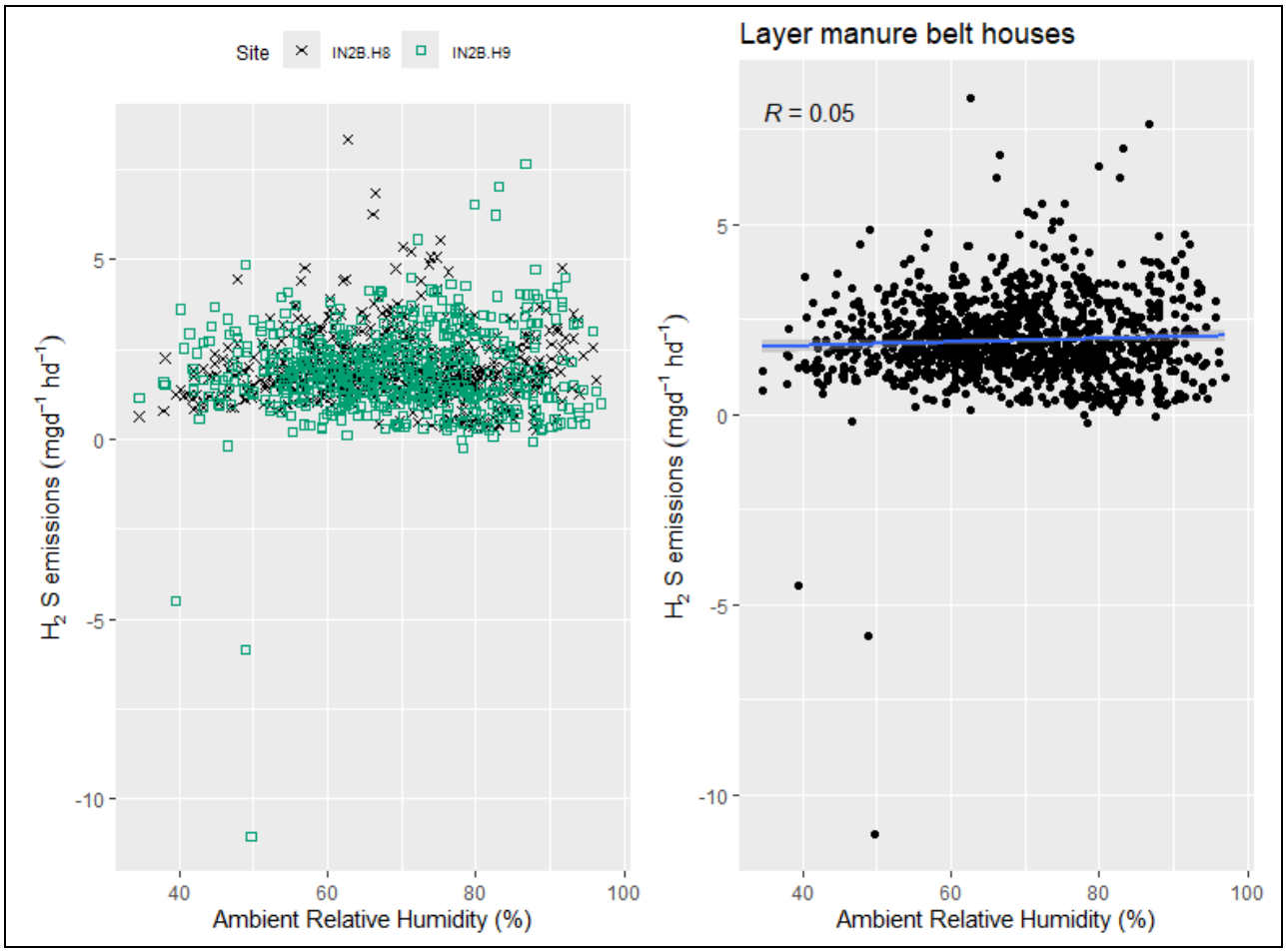

Figure 2.68: Scatter plot of layer manure belt houses H_2S emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

2.2.3 Particulate Matter (PM_{10})

2.2.3.1 Ambient temperature

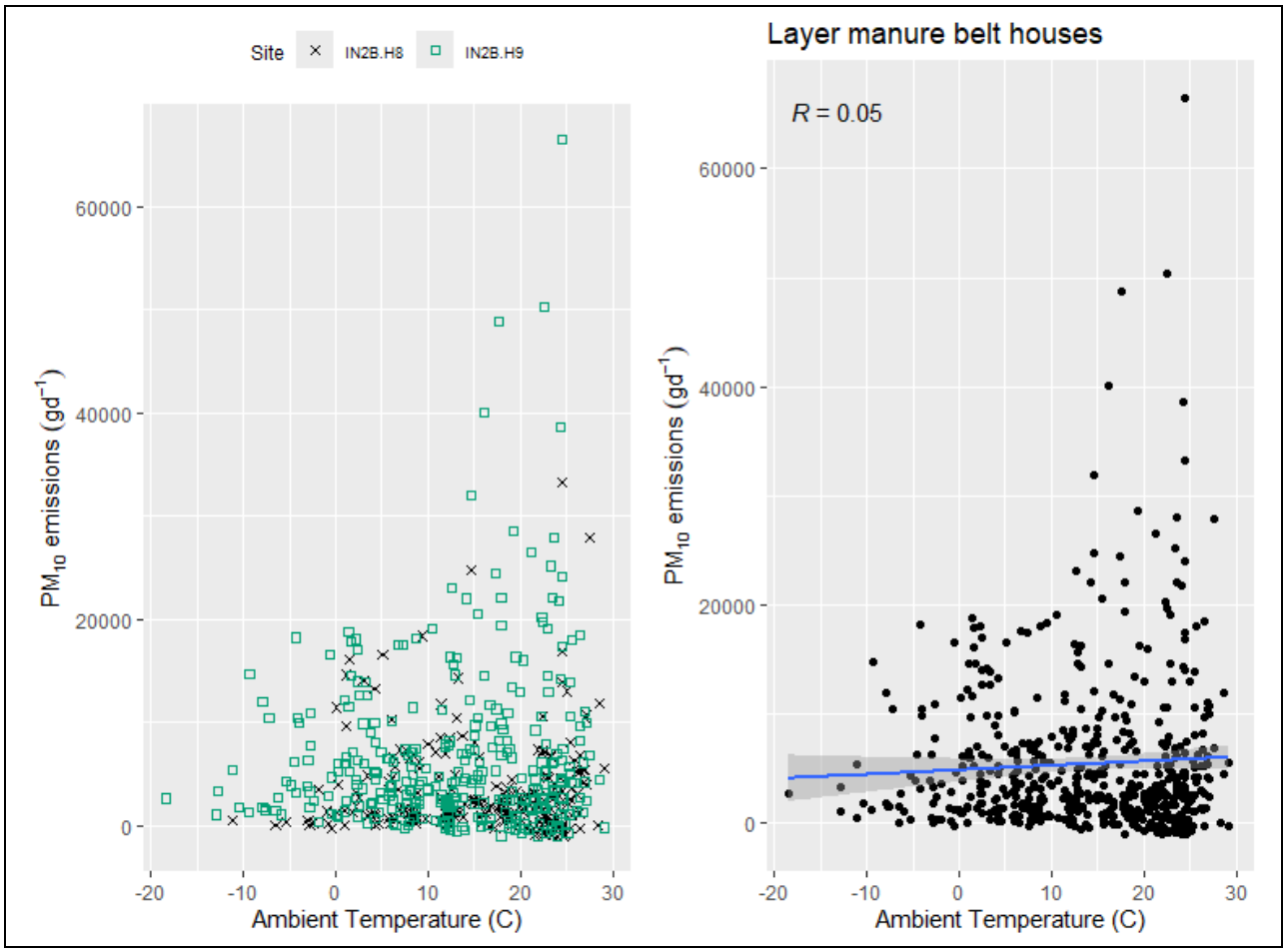

Figure 2.69: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus ambient temperature.

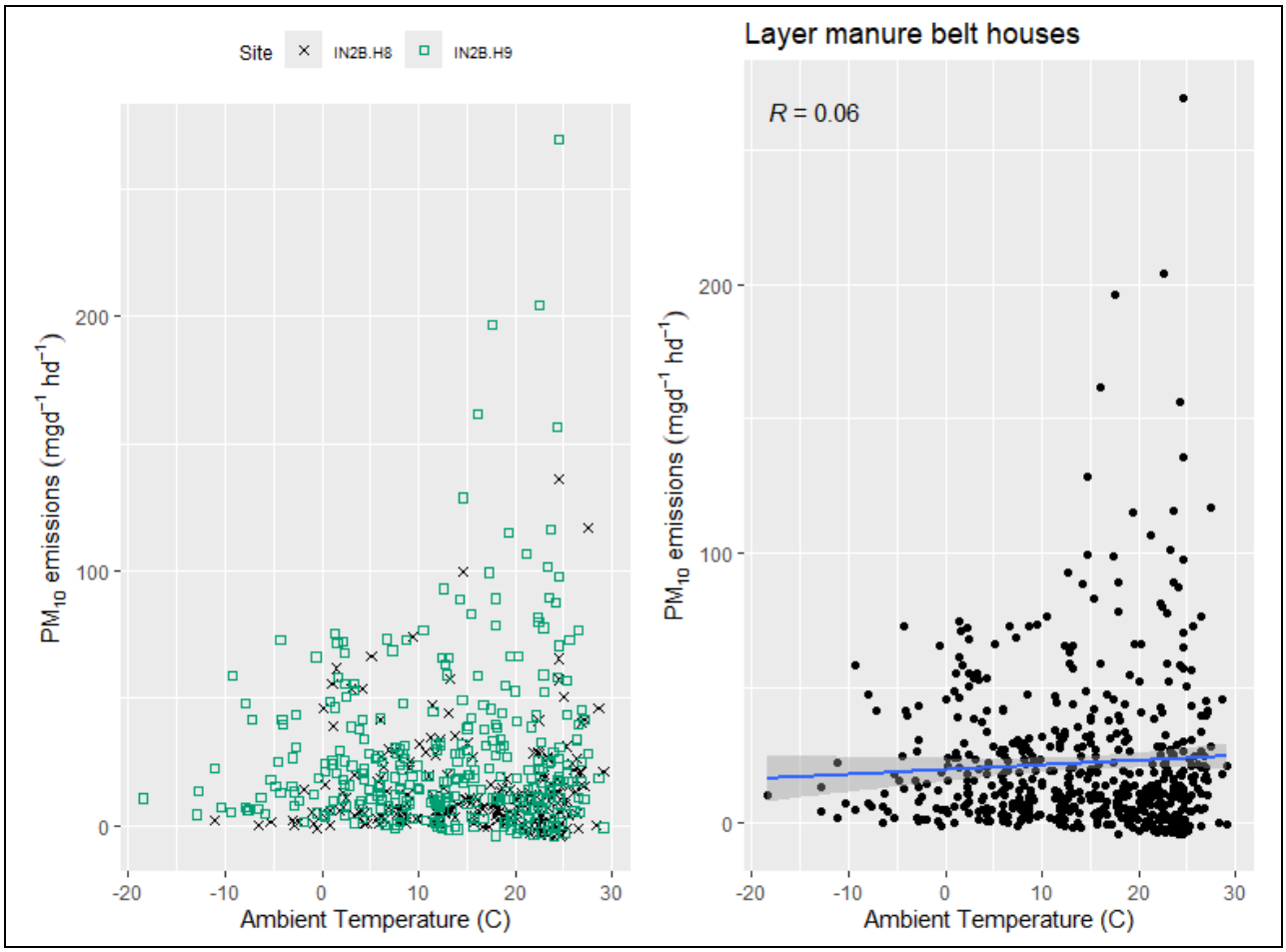

Figure 2.70: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

2.2.3.2 *Ambient relative humidity*

Figure 2.71: Scatter plot of layer manure belt houses PM_{10} emissions (g d^{-1}) versus ambient relative humidity.

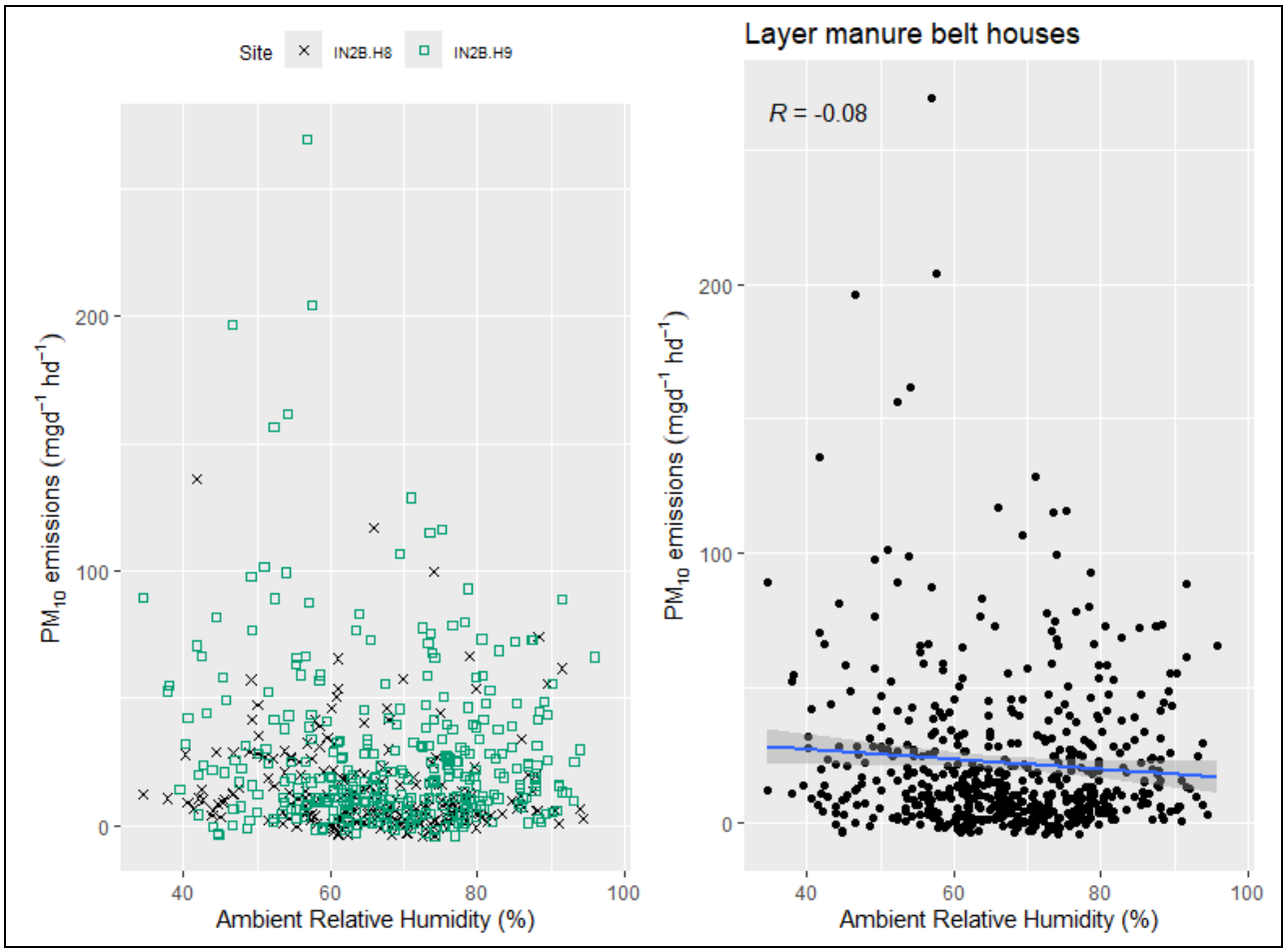

Figure 2.72: Scatter plot of layer manure belt houses PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

2.2.4 Particulate Matter ($PM_{2.5}$)

2.2.4.1 Ambient temperature

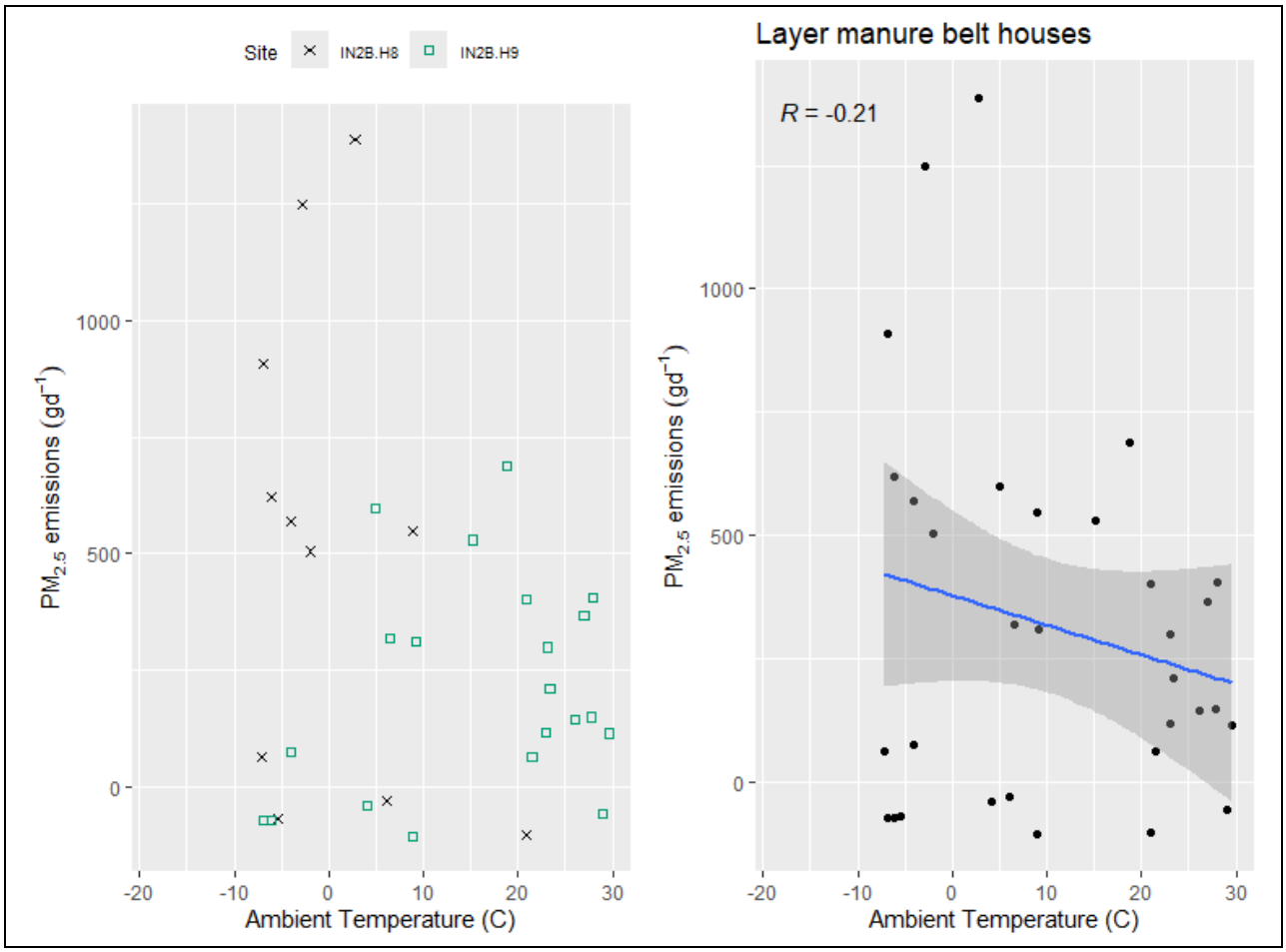

Figure 2.73: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus ambient temperature.

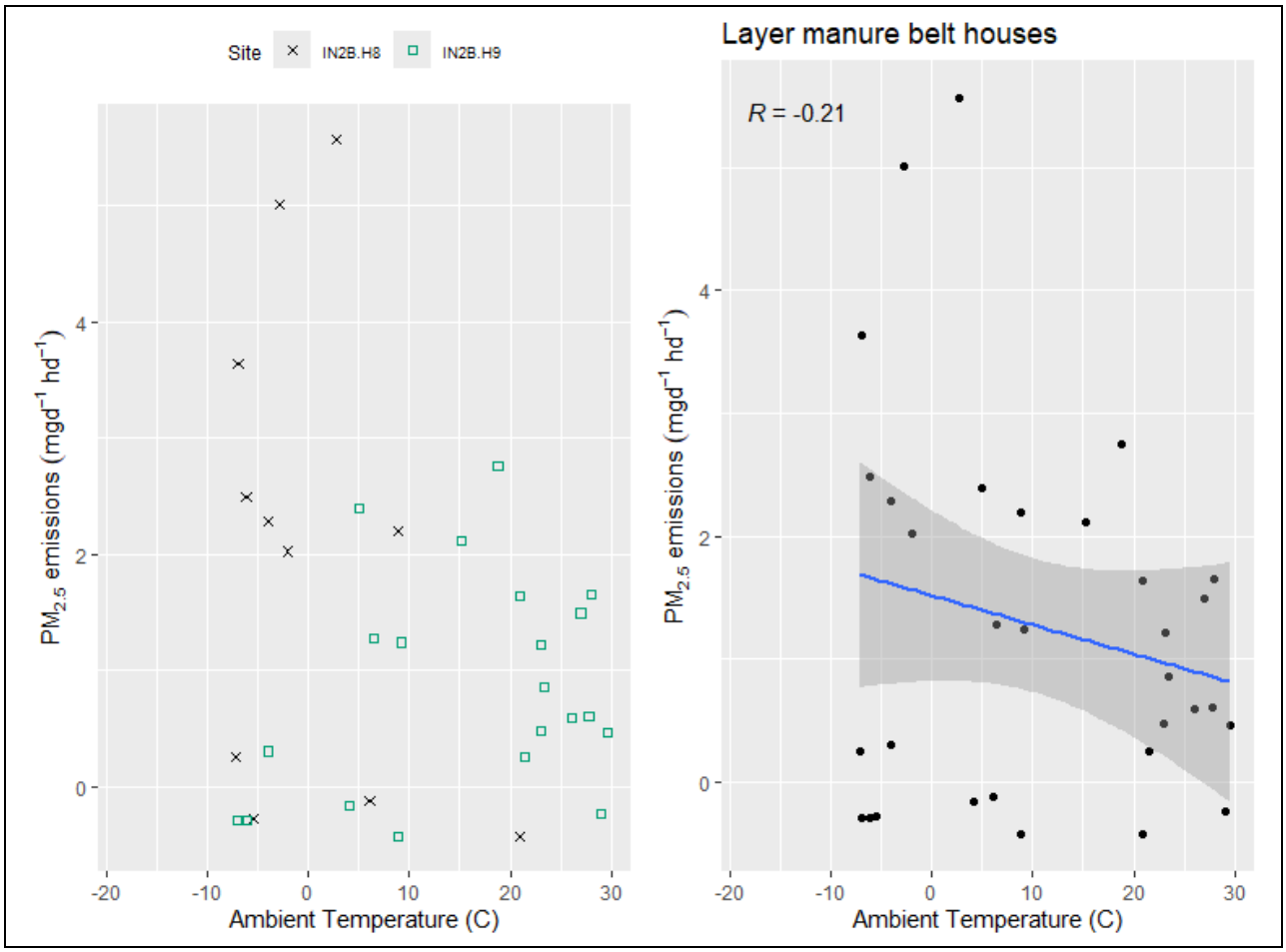

Figure 2.74: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

2.2.4.2 *Ambient relative humidity*

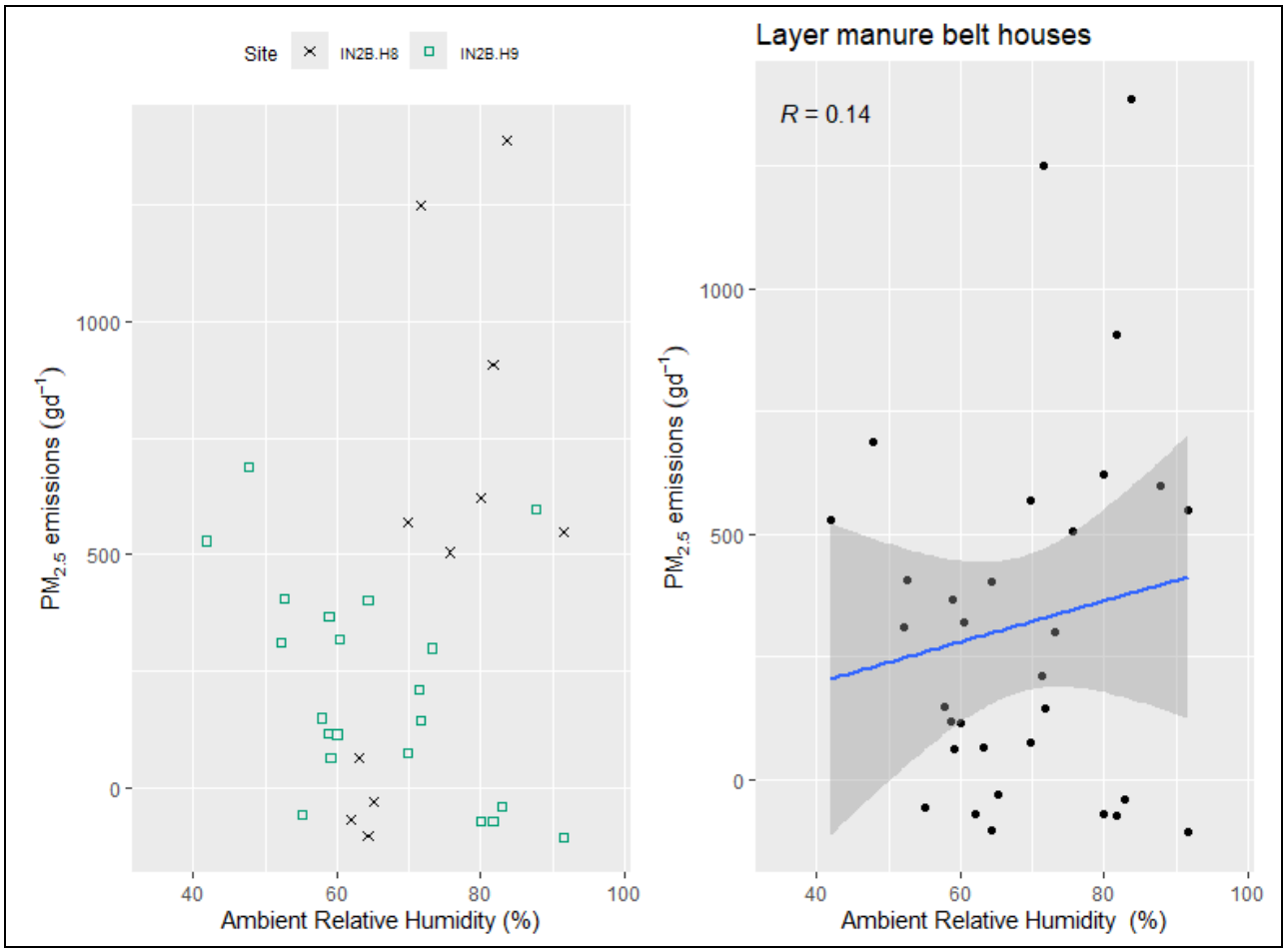

Figure 2.75: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (g d^{-1}) versus ambient relative humidity.

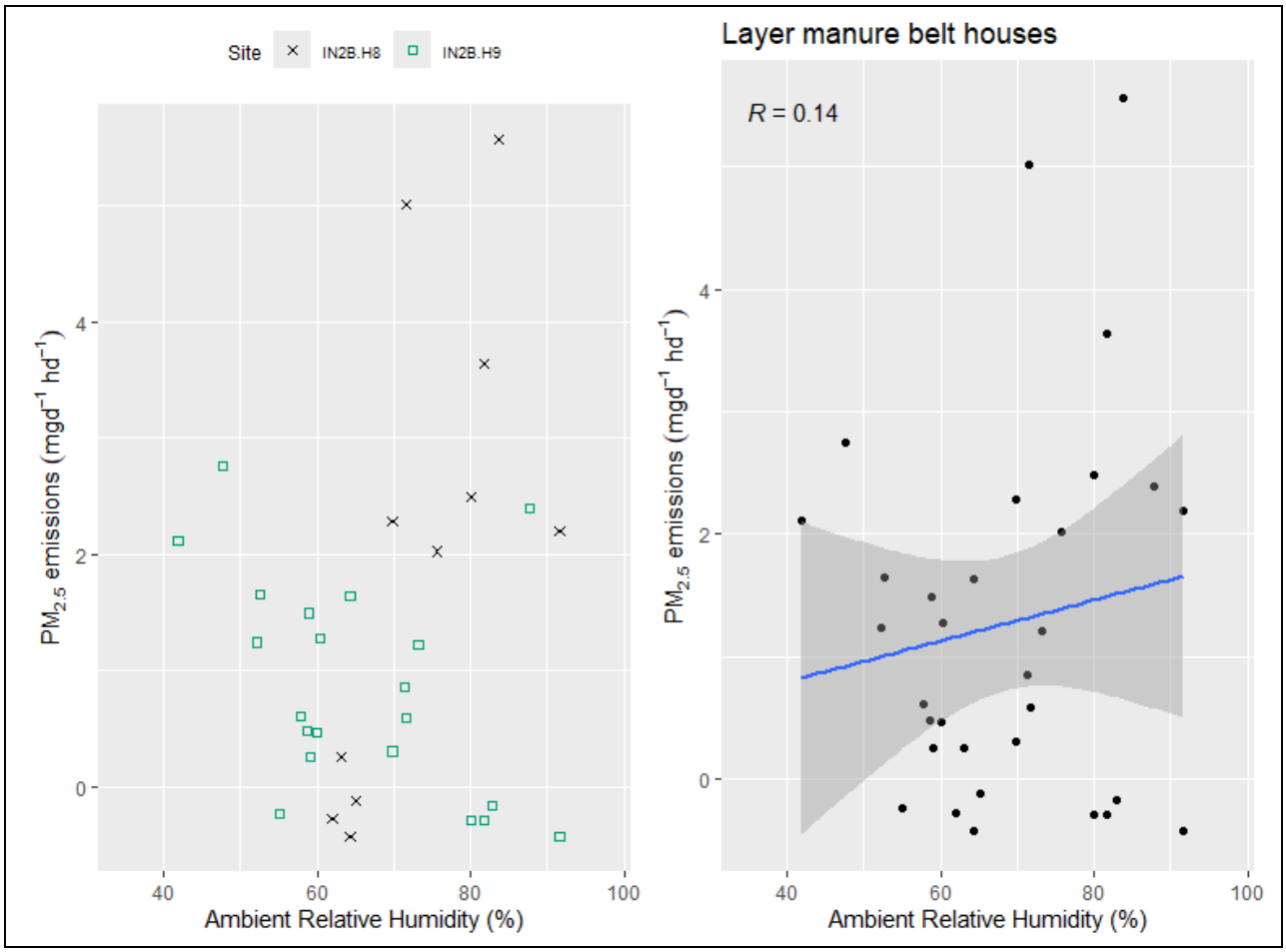

Figure 2.76: Scatter plot of layer manure belt houses $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

2.2.5 Total Suspended Particulates (TSP

2.2.5.1 Ambient temperature

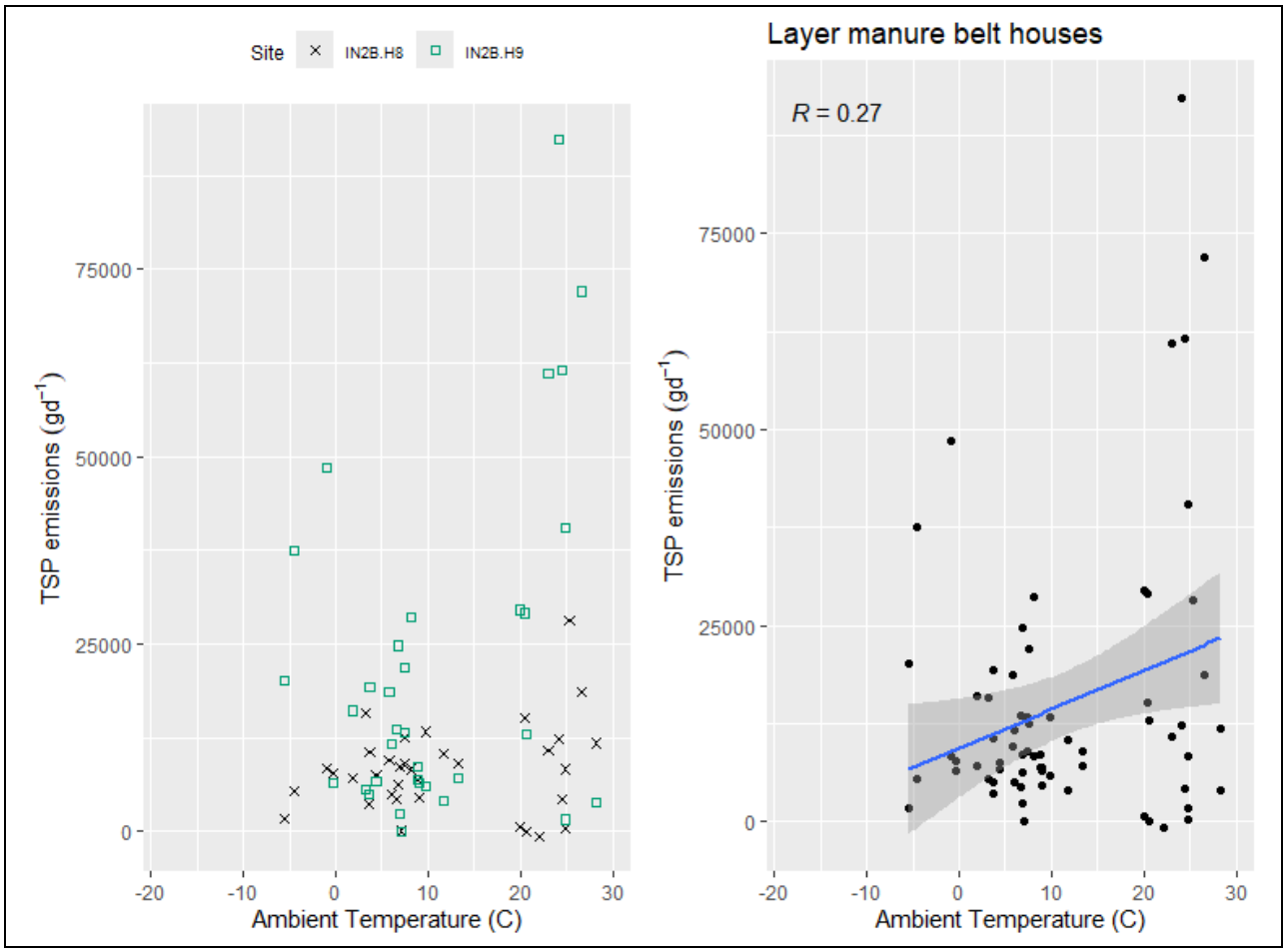

Figure 2.77: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus ambient temperature.

Figure 2.78: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

2.2.5.2 *Ambient relative humidity*

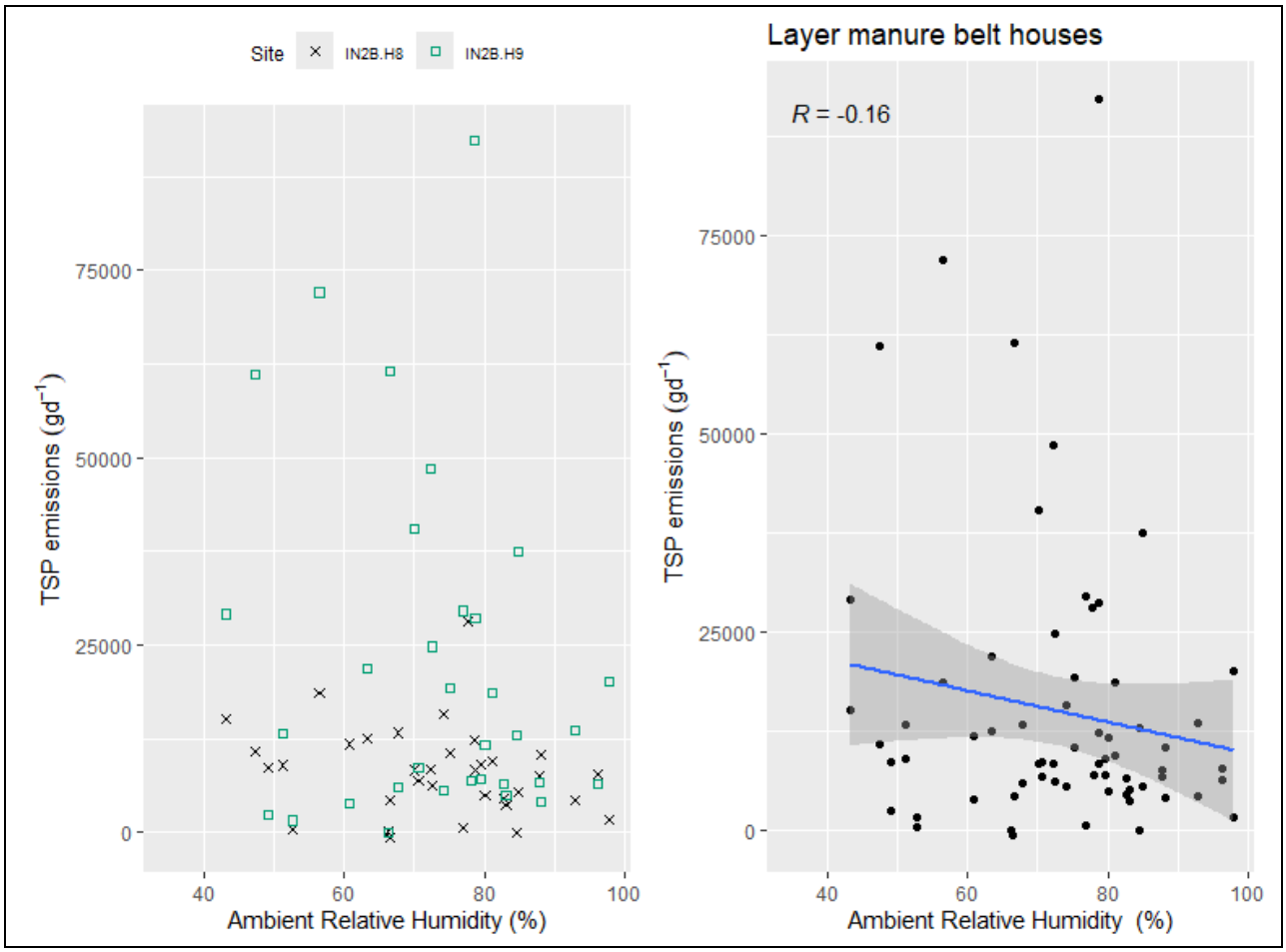

Figure 2.79: Scatter plot of layer manure belt houses TSP emissions (g d^{-1}) versus ambient relative humidity.

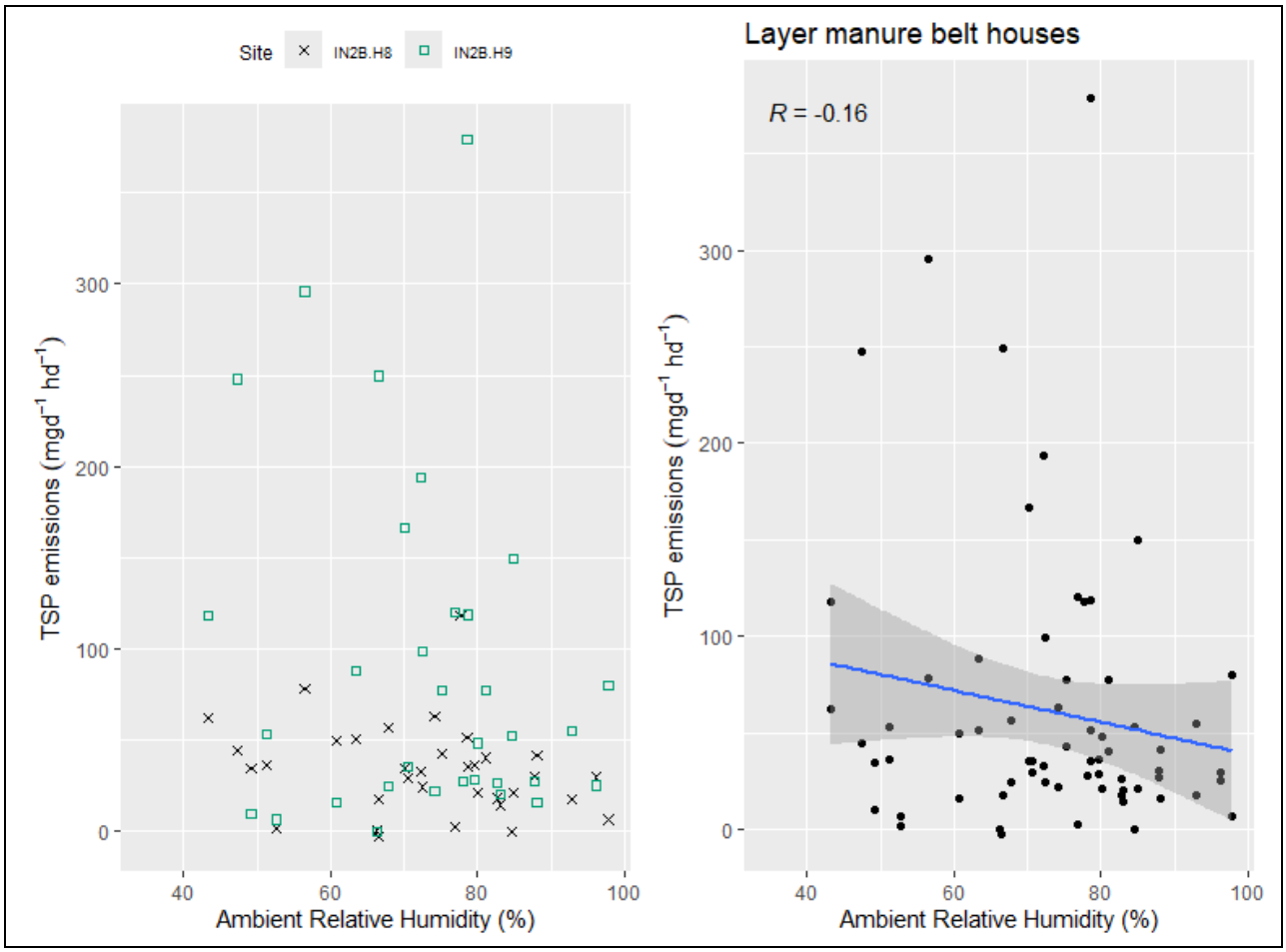

Figure 2.80: Scatter plot of layer manure belt houses TSP emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

3 Manure Sheds

3.1 Environmental

Table 3.1: Summary of layer manure sheds R^{-2} values for environmental parameters.

Emissions	Parameter	R	R^2	Strength
NH_3 (kgd^{-1})	Inventory (hd)	0.12	0.02	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Inventory (hd)	0.1	0.01	slight or weak
NH_3 (kgd^{-1})	Average weight (kg)	0.02	0	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Average weight (kg)	0.01	0	slight or weak
NH_3 (kgd^{-1})	Live animal weight (kg)	0.05	0	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Live animal weight (kg)	0.04	0	slight or weak
H_2S (gd^{-1})	Inventory (hd)	0.13	0.02	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Inventory (hd)	0.11	0.01	slight or weak
H_2S (gd^{-1})	Average weight (kg)	-0.17	0.03	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Average weight (kg)	-0.17	0.03	slight or weak
H_2S (gd^{-1})	Live animal weight (kg)	-0.04	0	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	-0.05	0	slight or weak
PM_{10} (gd^{-1})	Inventory (hd)	0.07	0.01	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Inventory (hd)	0.04	0	slight or weak
PM_{10} (gd^{-1})	Average weight (kg)	0.14	0.02	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Average weight (kg)	0.14	0.02	slight or weak
PM_{10} (gd^{-1})	Live animal weight (kg)	0.13	0.02	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	0.12	0.01	slight or weak
$PM_{2.5}$ (gd^{-1})	Inventory (hd)	0.55	0.31	modest
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Inventory (hd)	0.55	0.31	modest
$PM_{2.5}$ (gd^{-1})	Average weight (kg)	0.43	0.18	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Average weight (kg)	0.42	0.18	slight or weak
$PM_{2.5}$ (gd^{-1})	Live animal weight (kg)	0.53	0.29	modest
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	0.53	0.28	modest
TSP (gd^{-1})	Inventory (hd)	-0.16	0.02	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Inventory (hd)	-0.17	0.03	slight or weak
TSP (gd^{-1})	Average weight (kg)	-0.11	0.01	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Average weight (kg)	-0.1	0.01	slight or weak
TSP (gd^{-1})	Live animal weight (kg)	-0.18	0.03	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Live animal weight (kg)	-0.19	0.03	slight or weak

3.1.1 Ammonia (NH_3)

3.1.1.1 Inventory

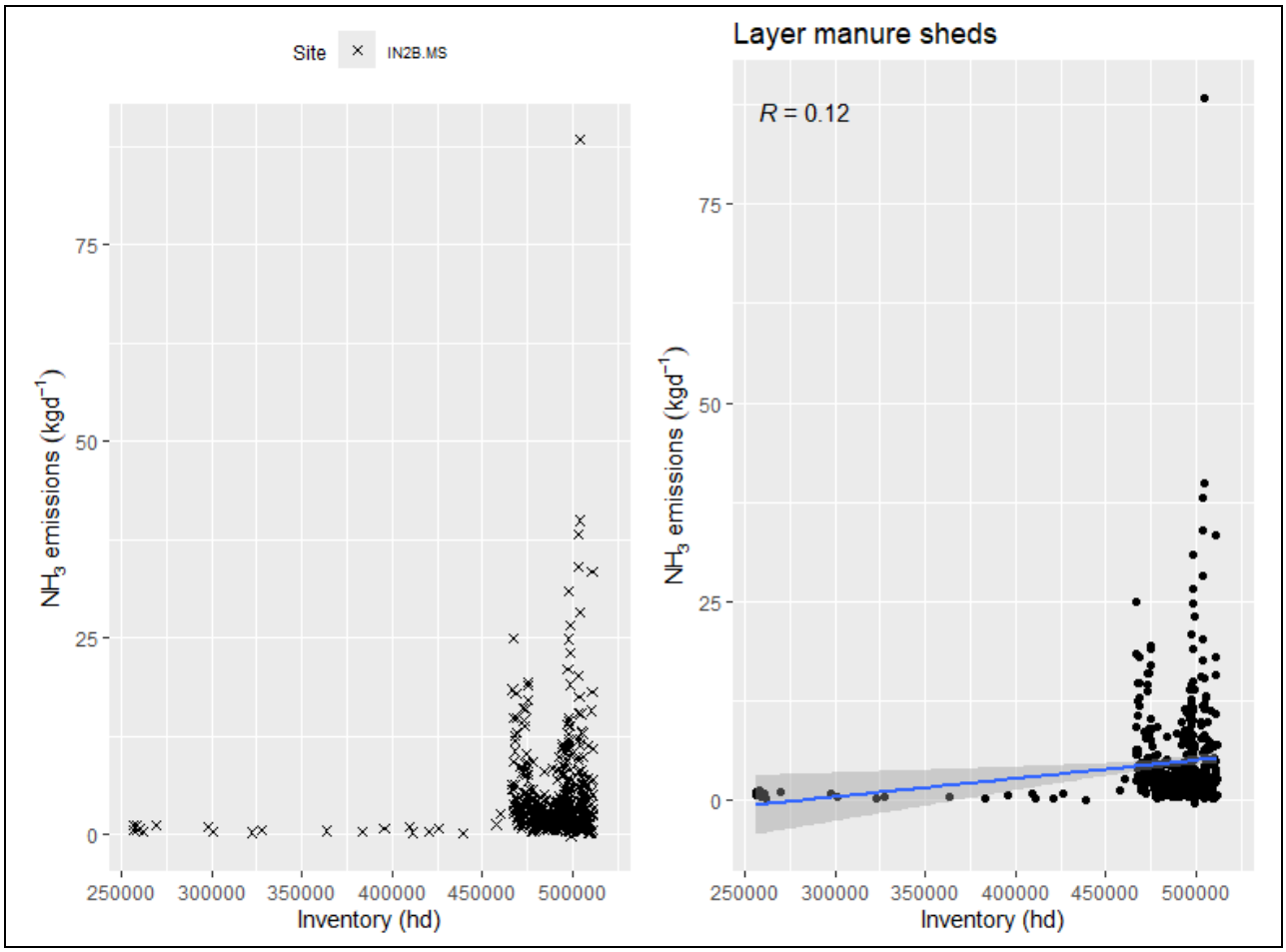

Figure 3.1: Scatter plot of layer manure sheds NH_3 emissions (kg d^{-1}) versus Inventory.

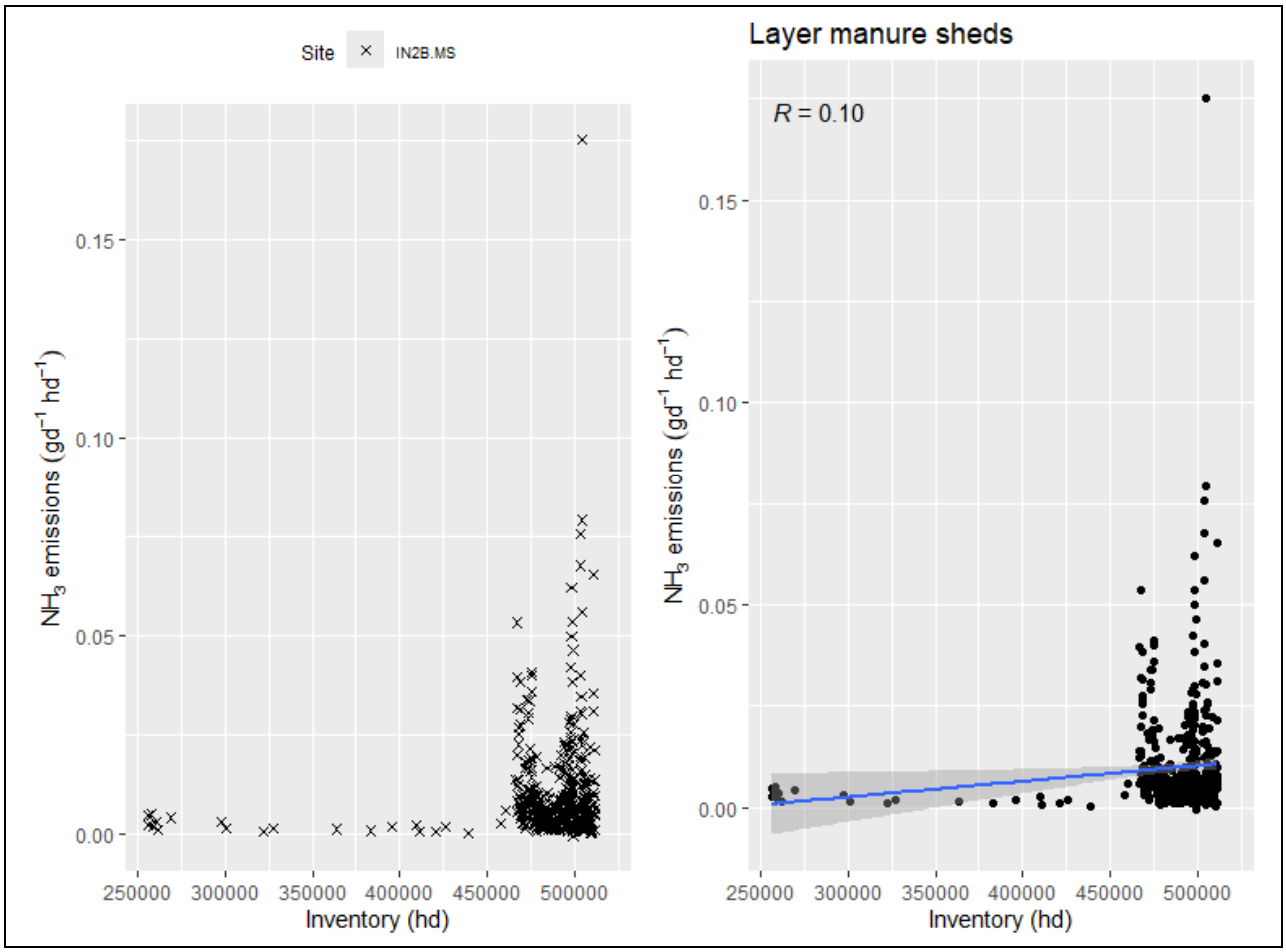

Figure 3.2: Scatter plot of layer manure sheds NH_3 emissions (g $d^{-1}hd^{-1}$) versus Inventory.

3.1.1.2 Average animal weight

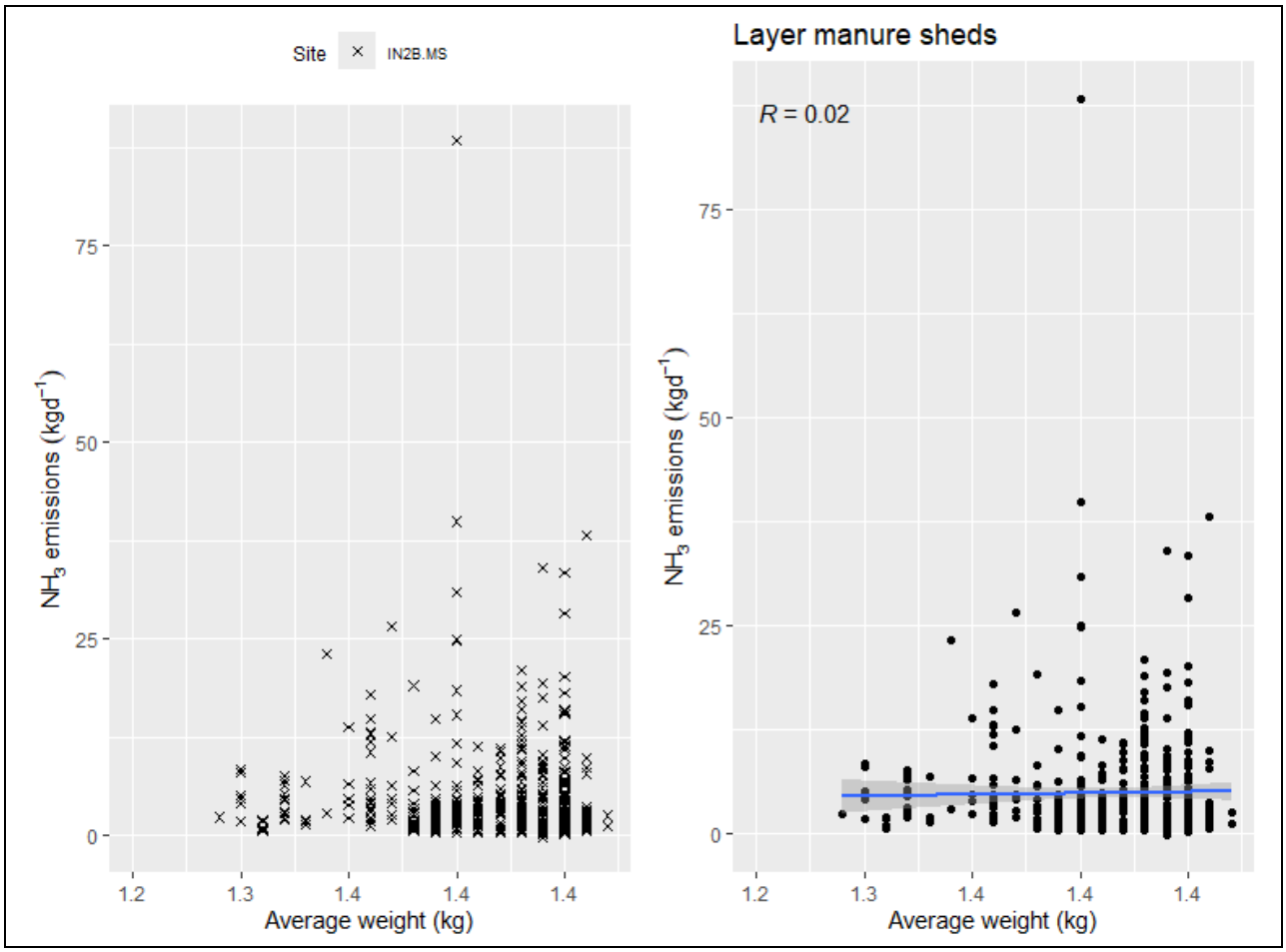

Figure 3.3: Scatter plot of layer manure sheds NH_3 emissions (kg d^{-1}) versus average animal weight.

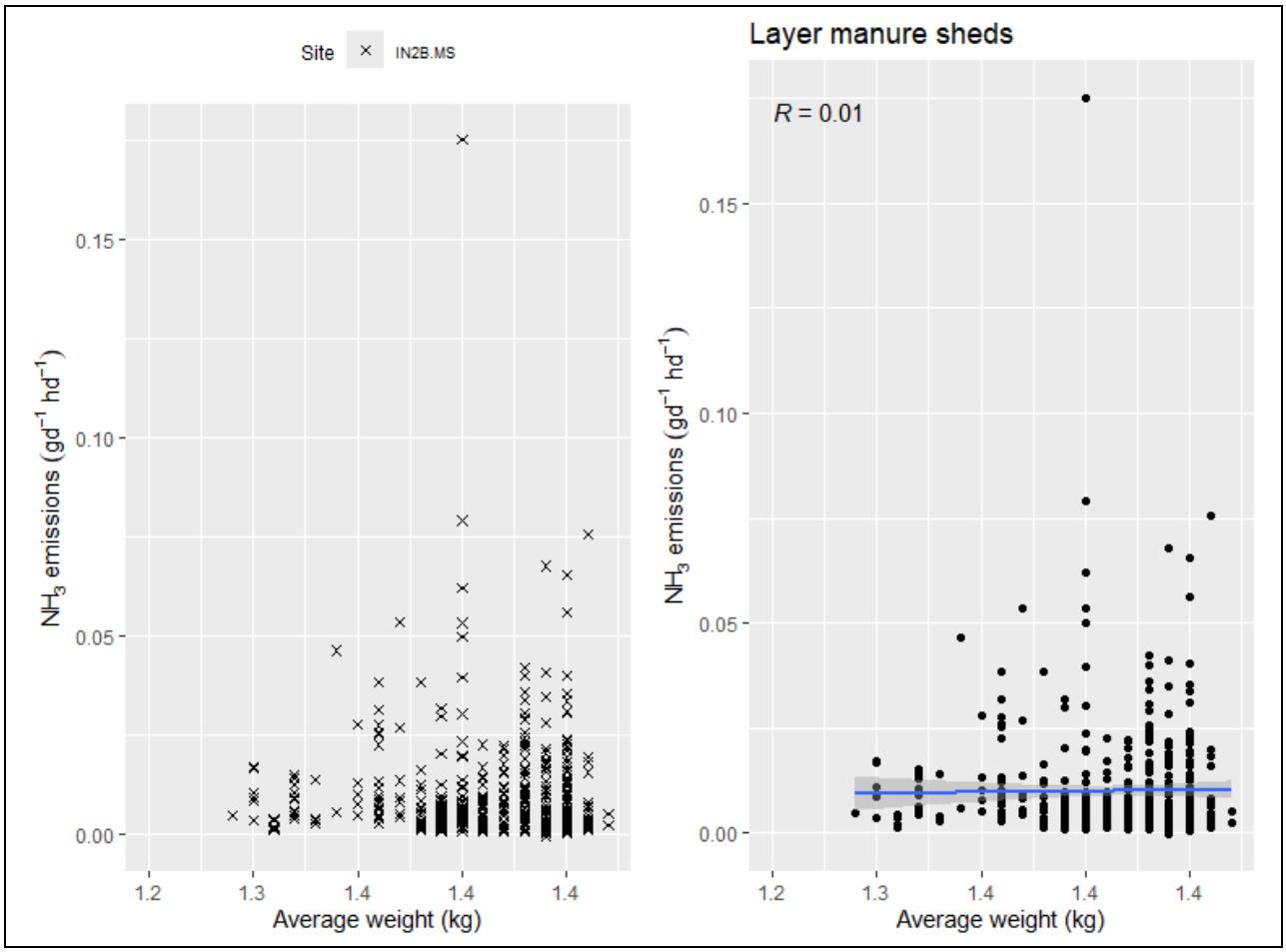

Figure 3.4: Scatter plot of layer manure sheds NH_3 emissions (g $d^{-1}hd^{-1}$) versus average animal weight.

3.1.1.3 Live animal weight

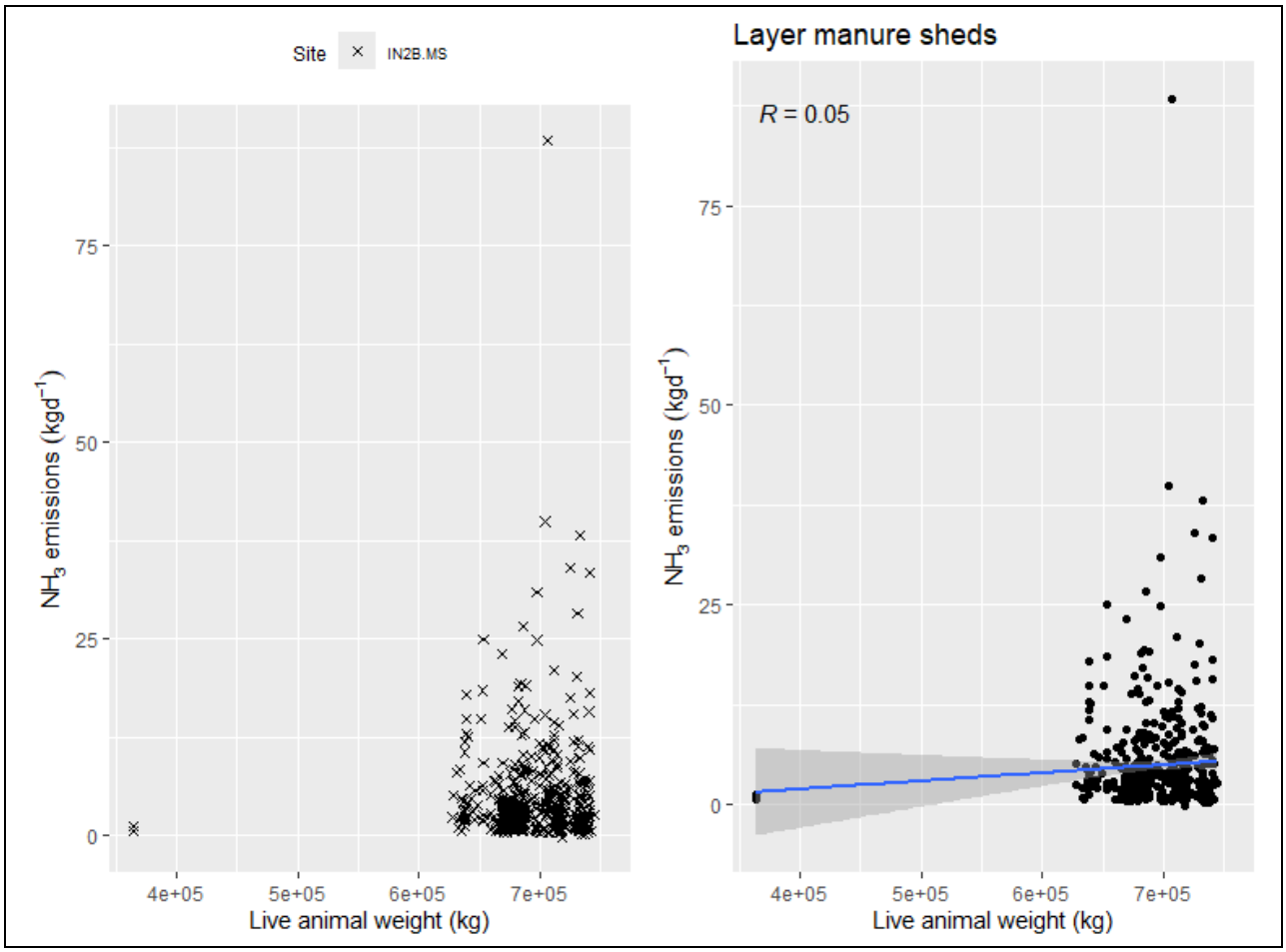

Figure 3.5: Scatter plot of layer manure sheds NH_3 emissions (kg d^{-1}) versus live animal weight.

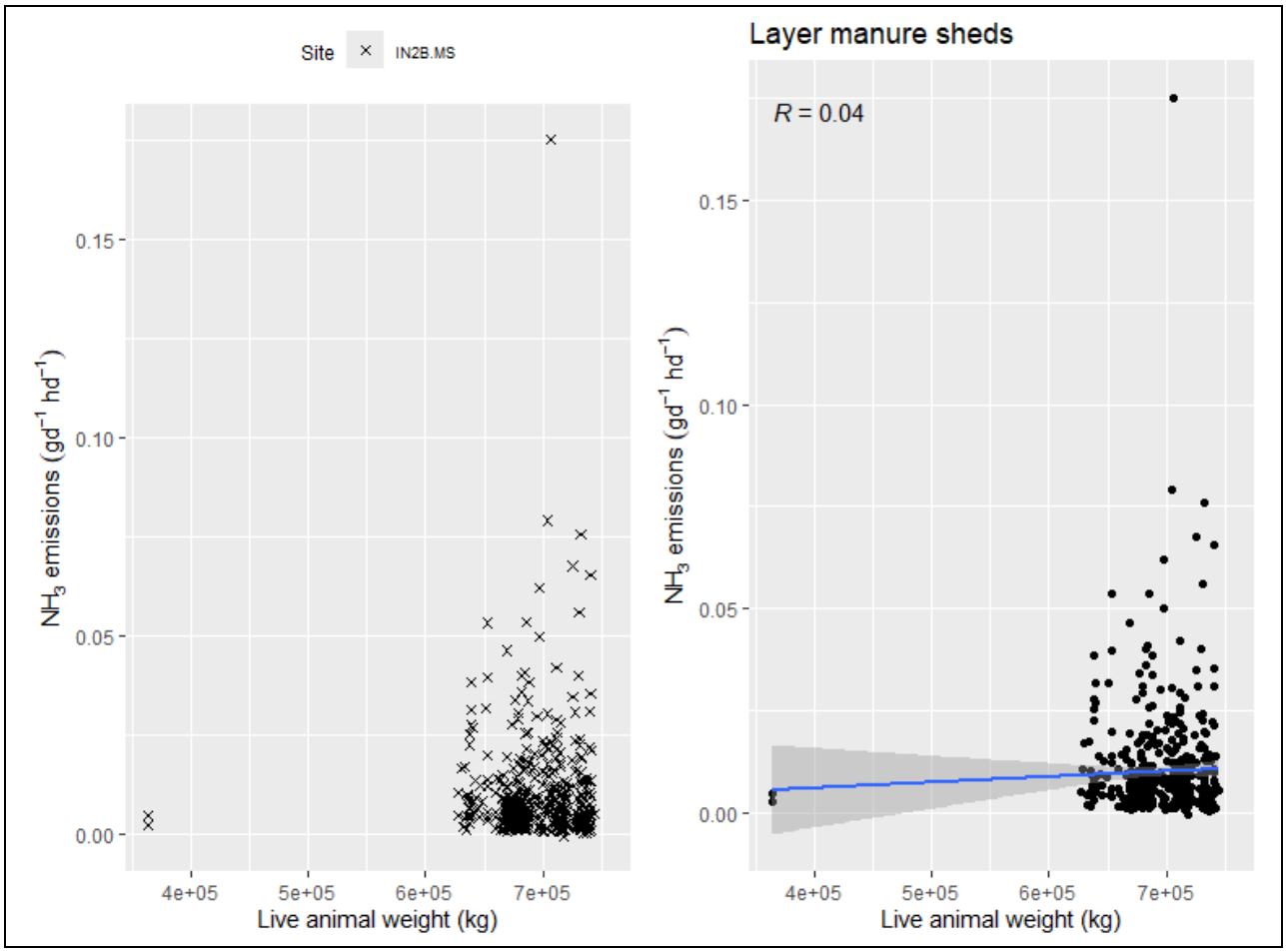

Figure 3.6: Scatter plot of layer manure sheds NH_3 emissions (g $d^{-1}hd^{-1}$) versus live animal weight.

3.1.2 Hydrogen Sulfide (H_2S)

3.1.2.1 Inventory

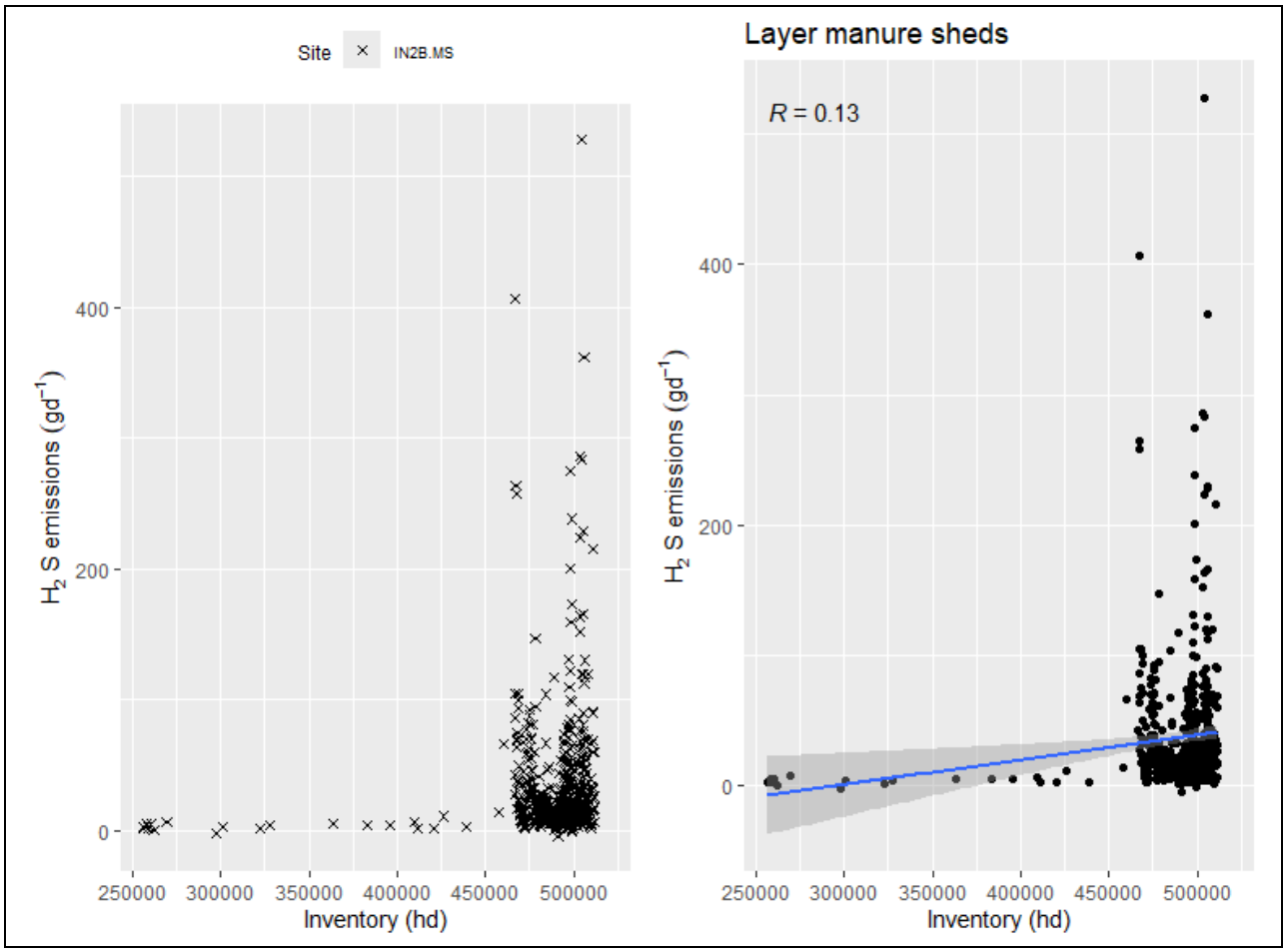

Figure 3.7: Scatter plot of layer manure sheds H_2S emissions (g d^{-1}) versus Inventory.

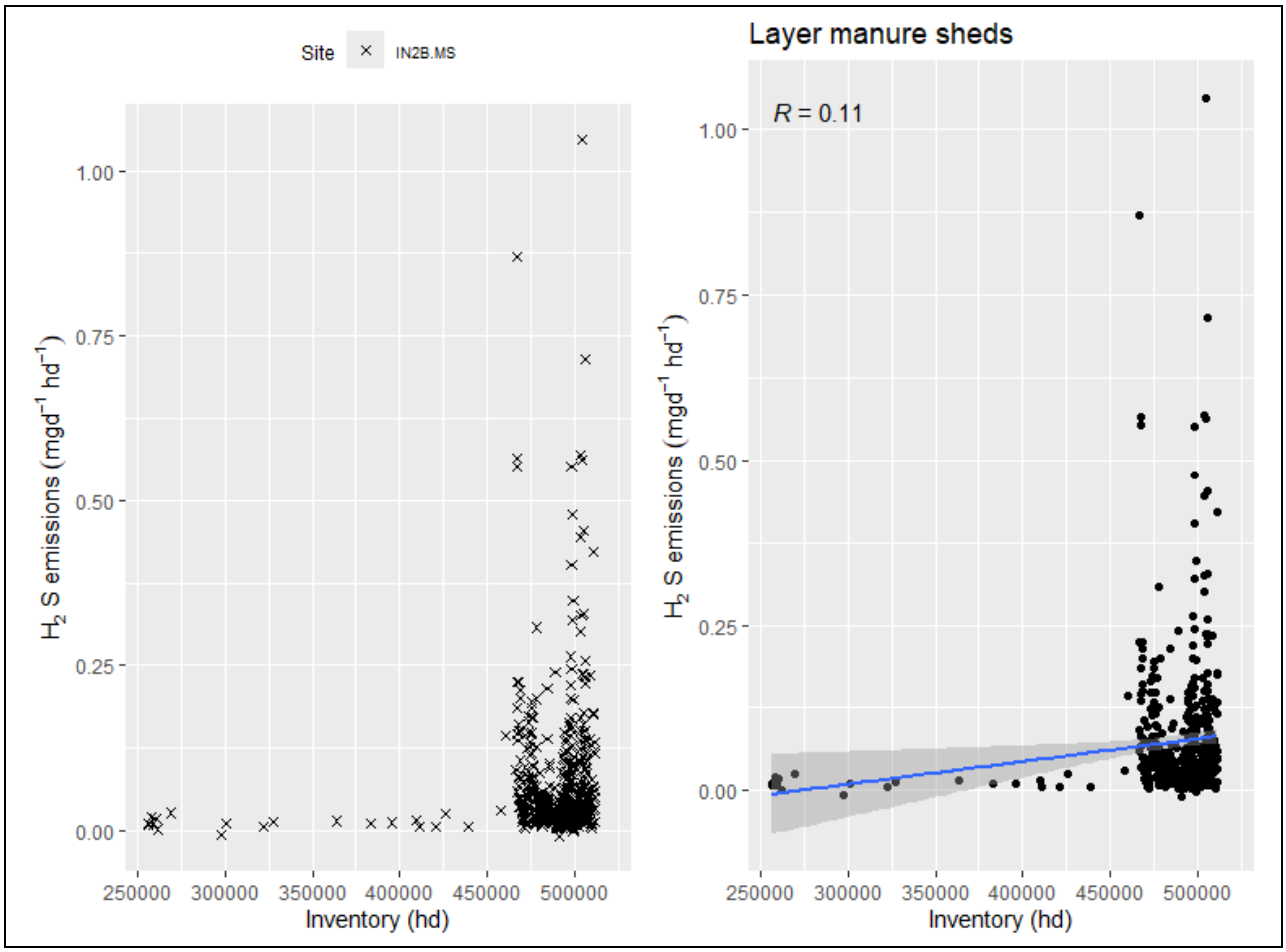

Figure 3.8: Scatter plot of layer manure sheds H_2S emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

3.1.2.2 Average animal weight

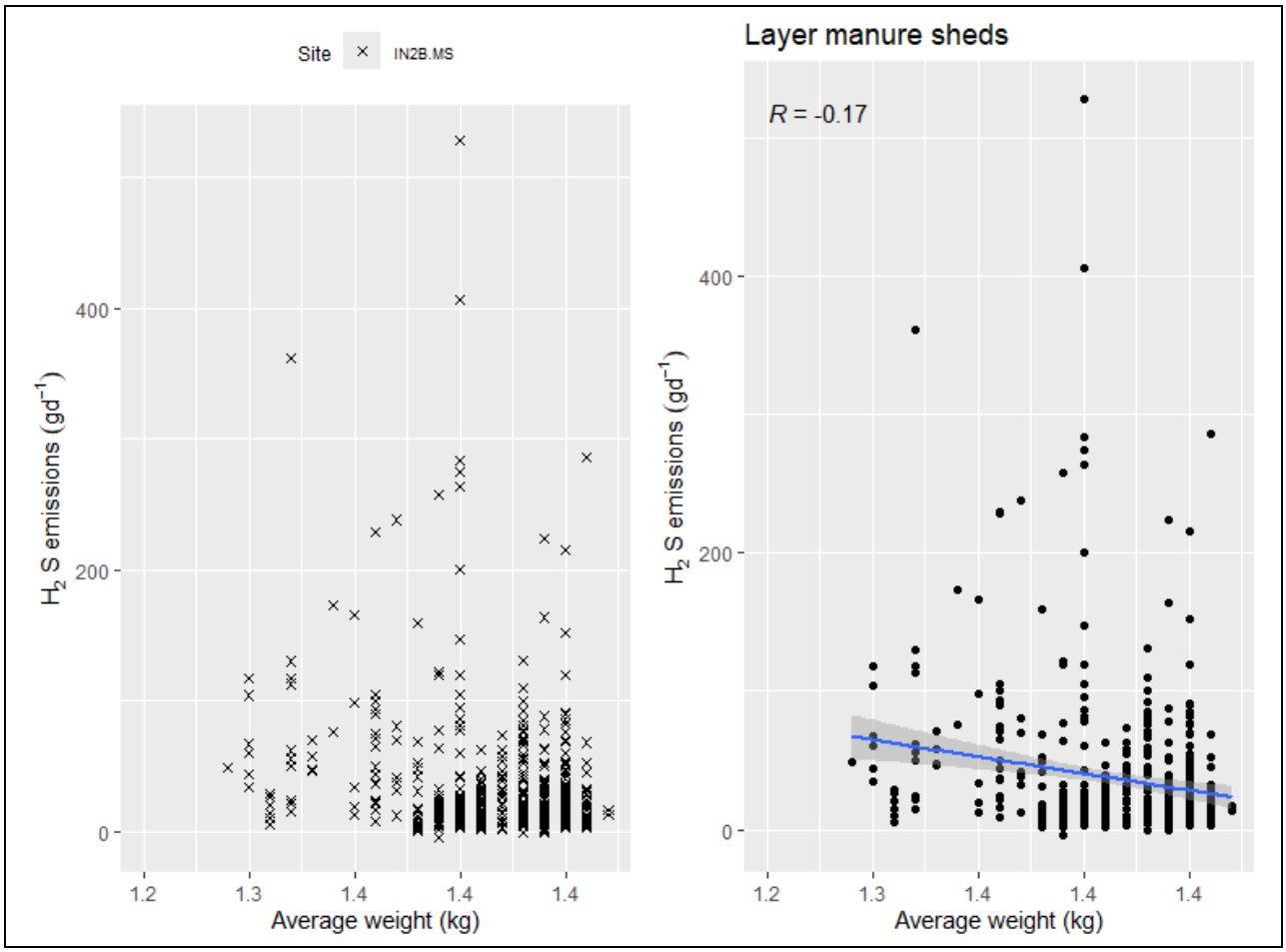

Figure 3.9: Scatter plot of layer manure sheds H_2S emissions (g d^{-1}) versus average animal weight.

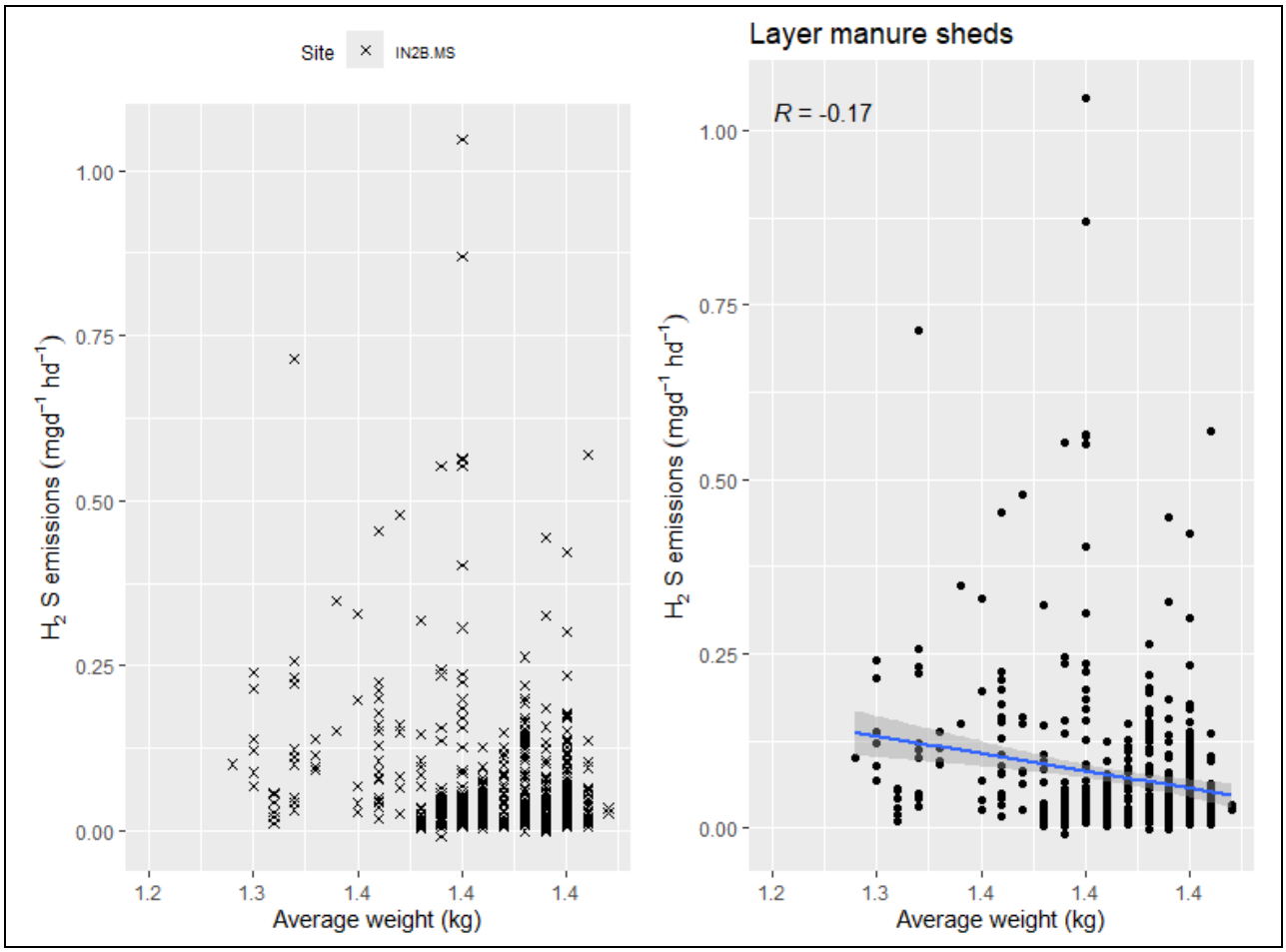

Figure 3.10: Scatter plot of layer manure sheds H_2S emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

3.1.2.3 Live animal weight

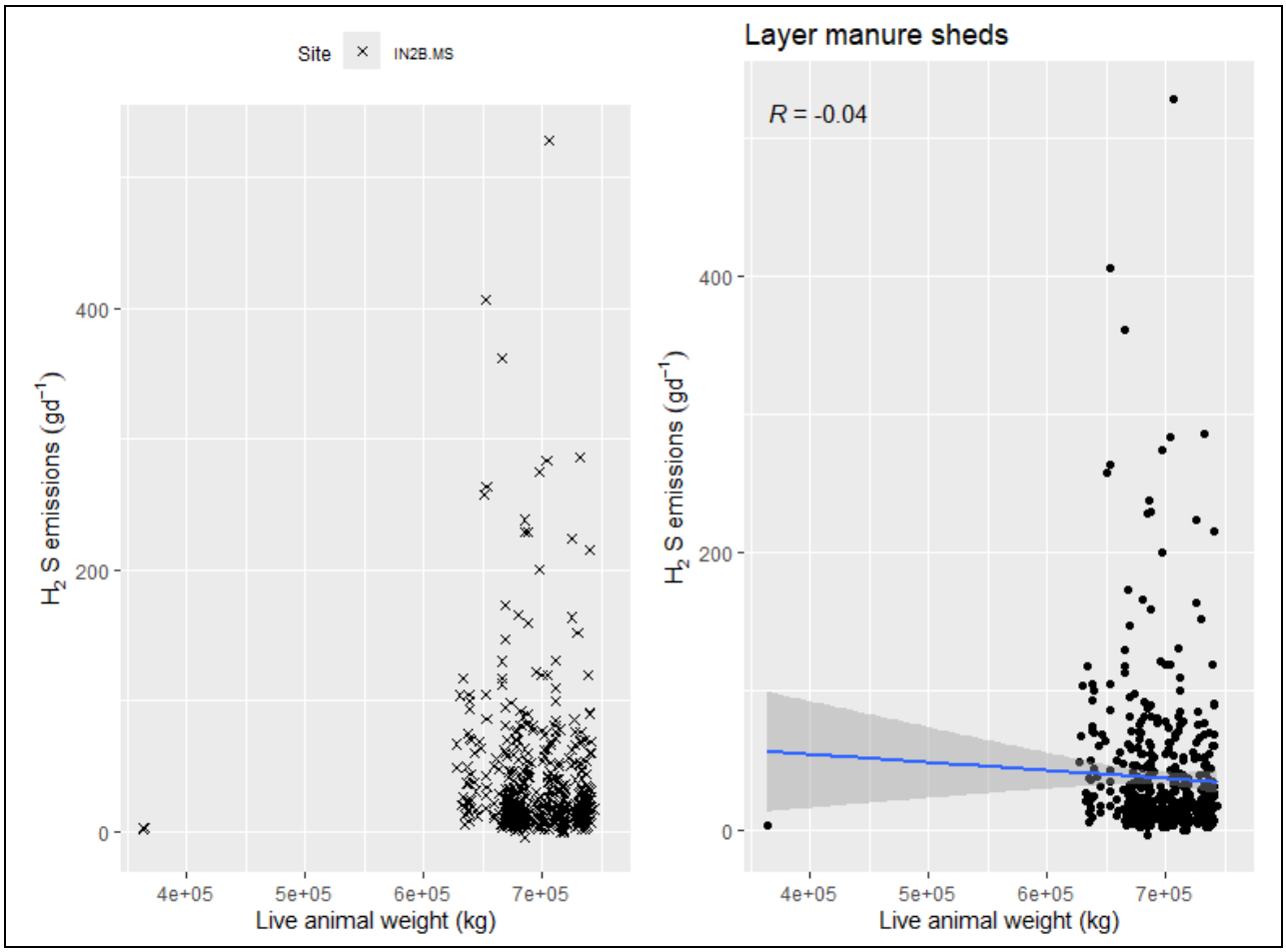

Figure 3.11: Scatter plot of layer manure sheds H_2S emissions (g d^{-1}) versus live animal weight.

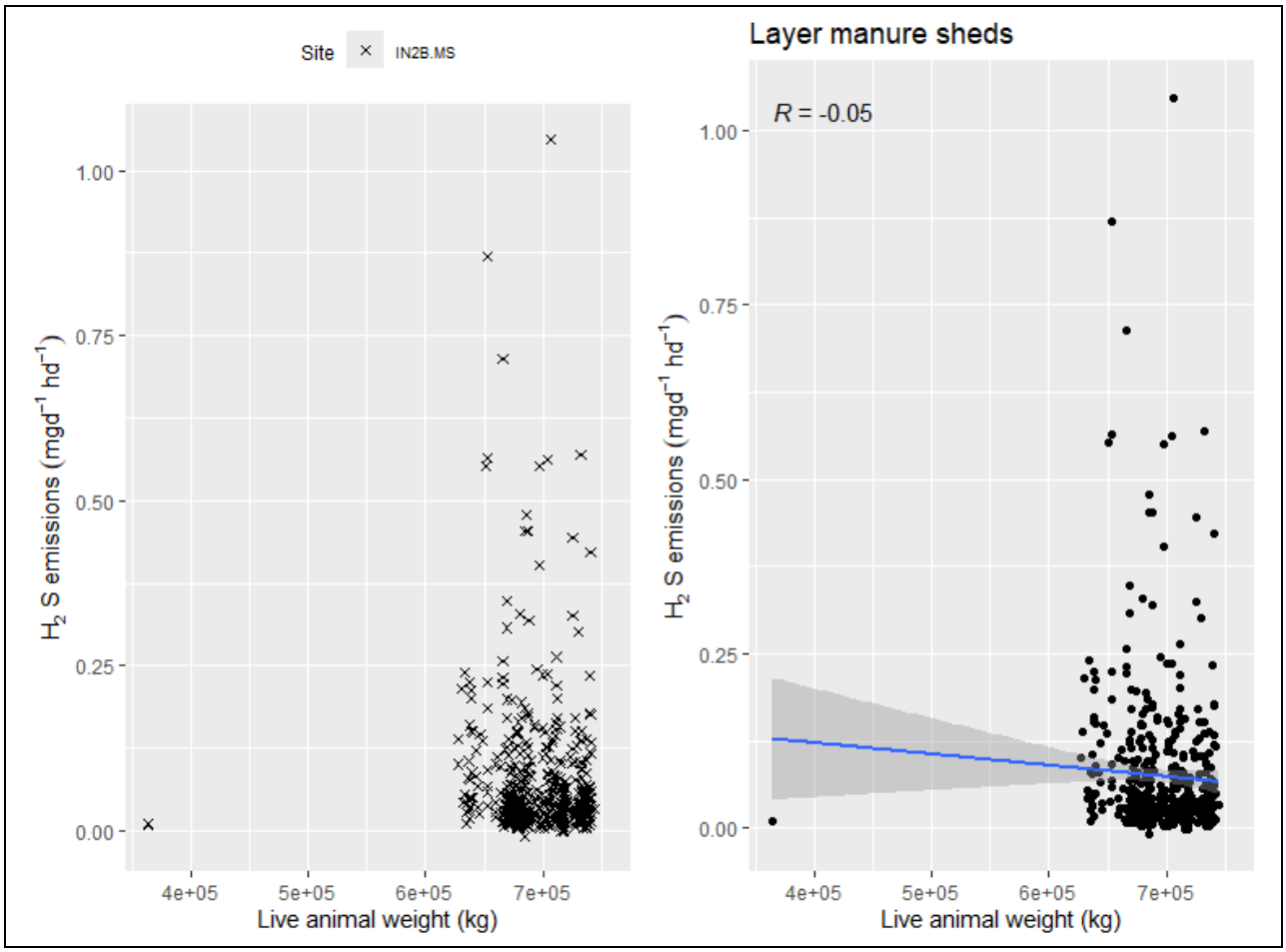

Figure 3.12: Scatter plot of layer manure sheds H_2S emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

3.1.3 Particulate Matter (PM_{10})

3.1.3.1 Inventory

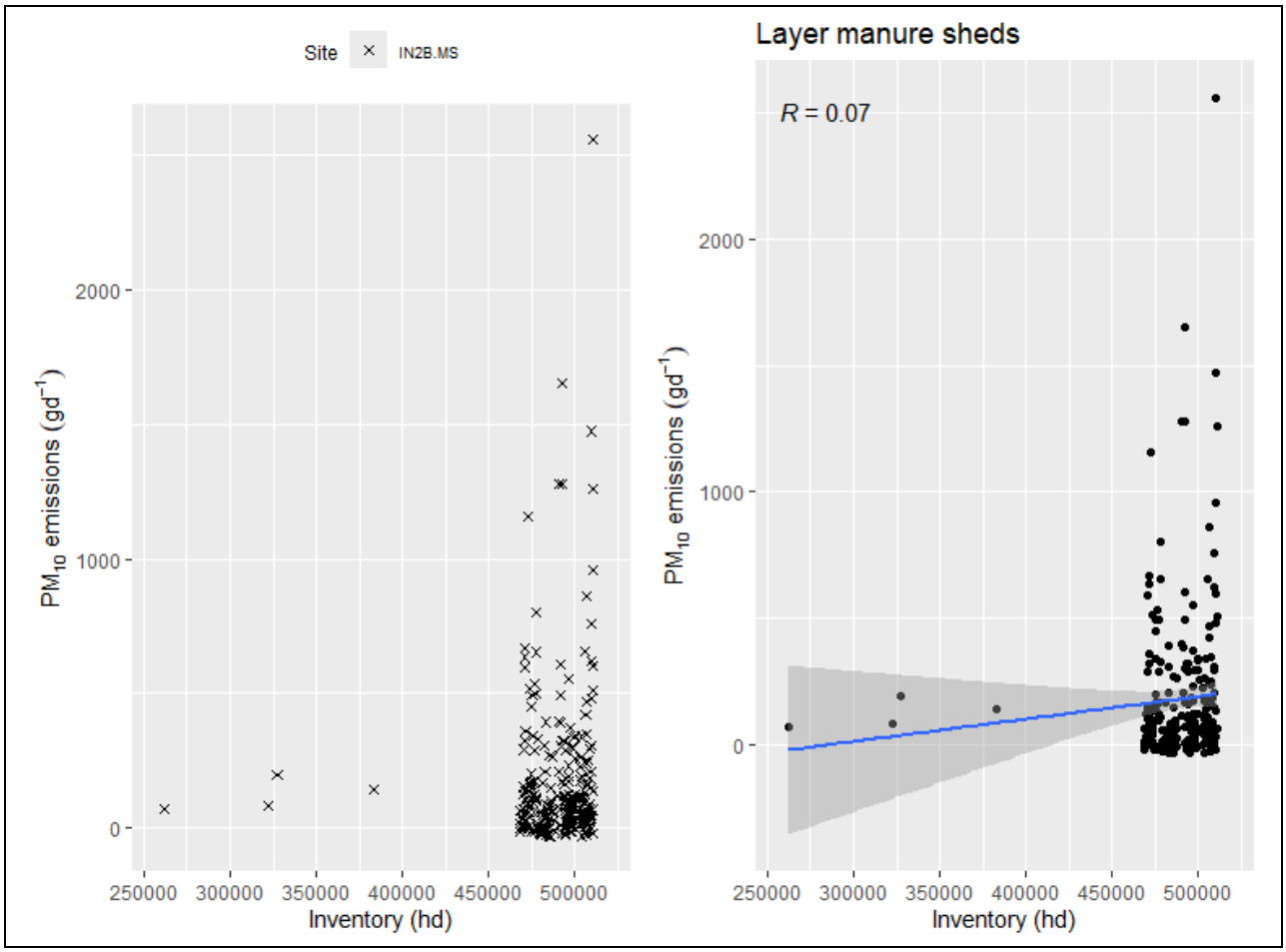

Figure 3.13: Scatter plot of layer manure sheds PM_{10} emissions (g d^{-1}) versus Inventory.

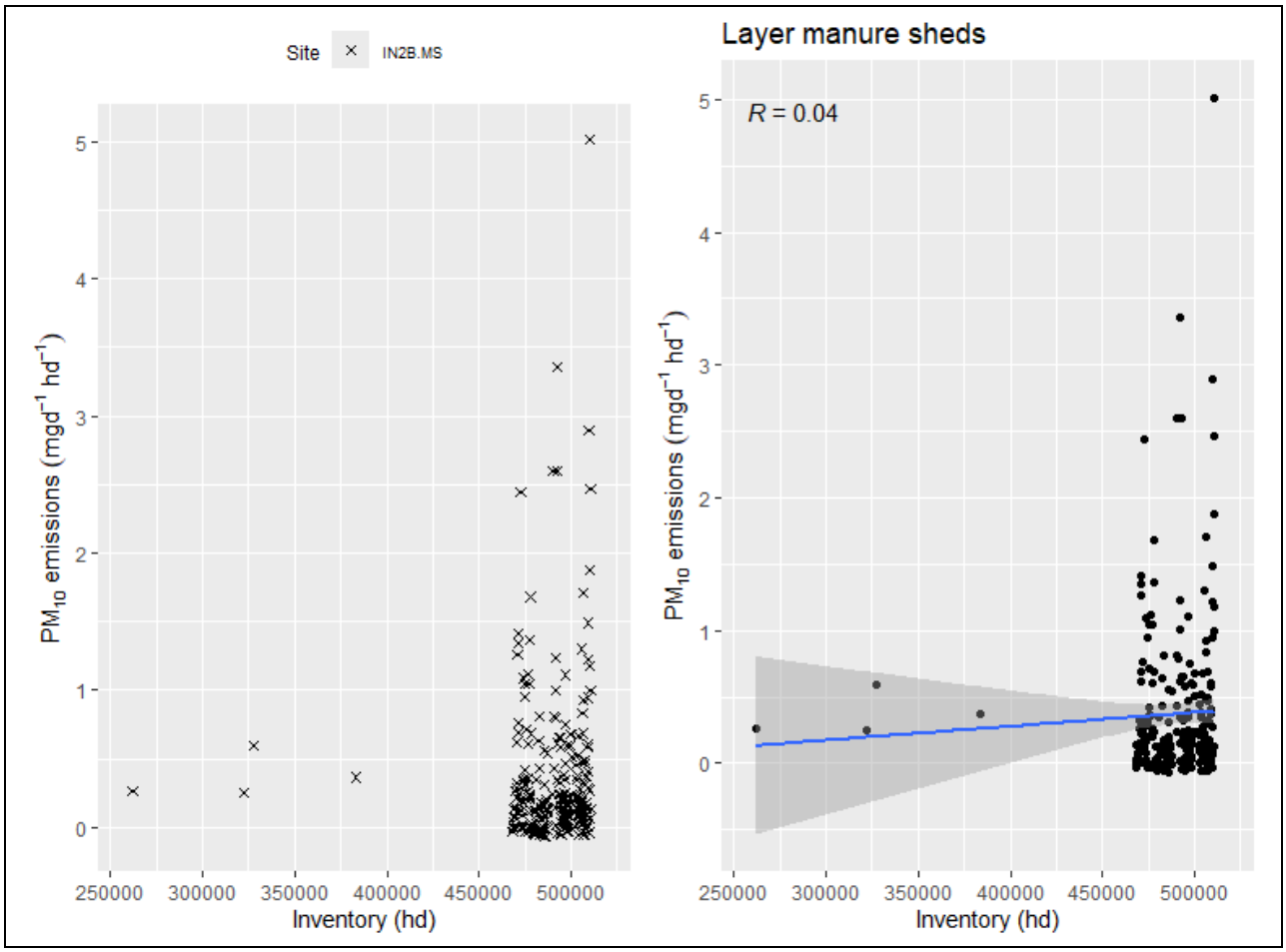

Figure 3.14: Scatter plot of layer manure sheds PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

3.1.3.2 Average animal weight

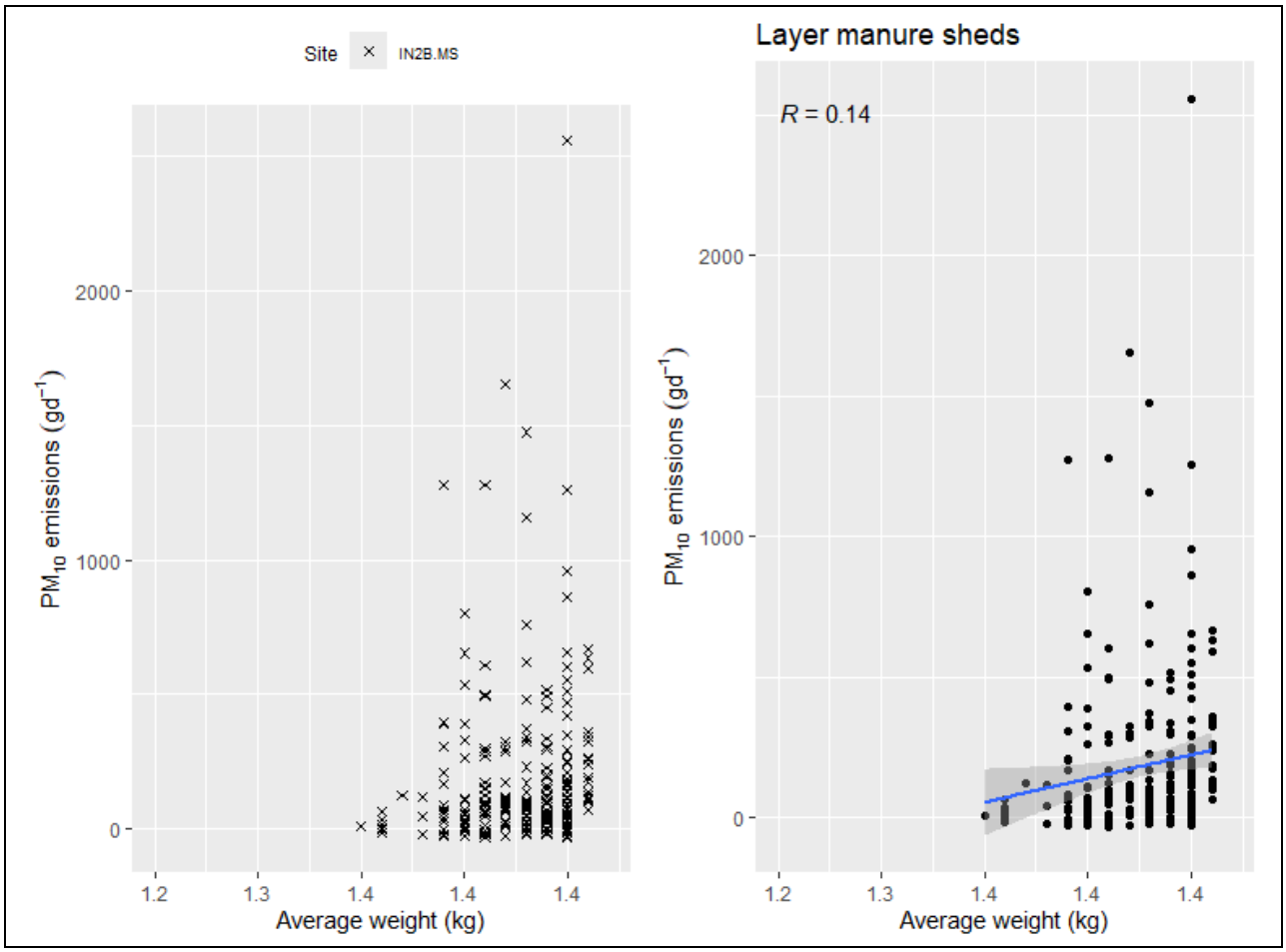

Figure 3.15: Scatter plot of layer manure sheds PM_{10} emissions (g d^{-1}) versus average animal weight.

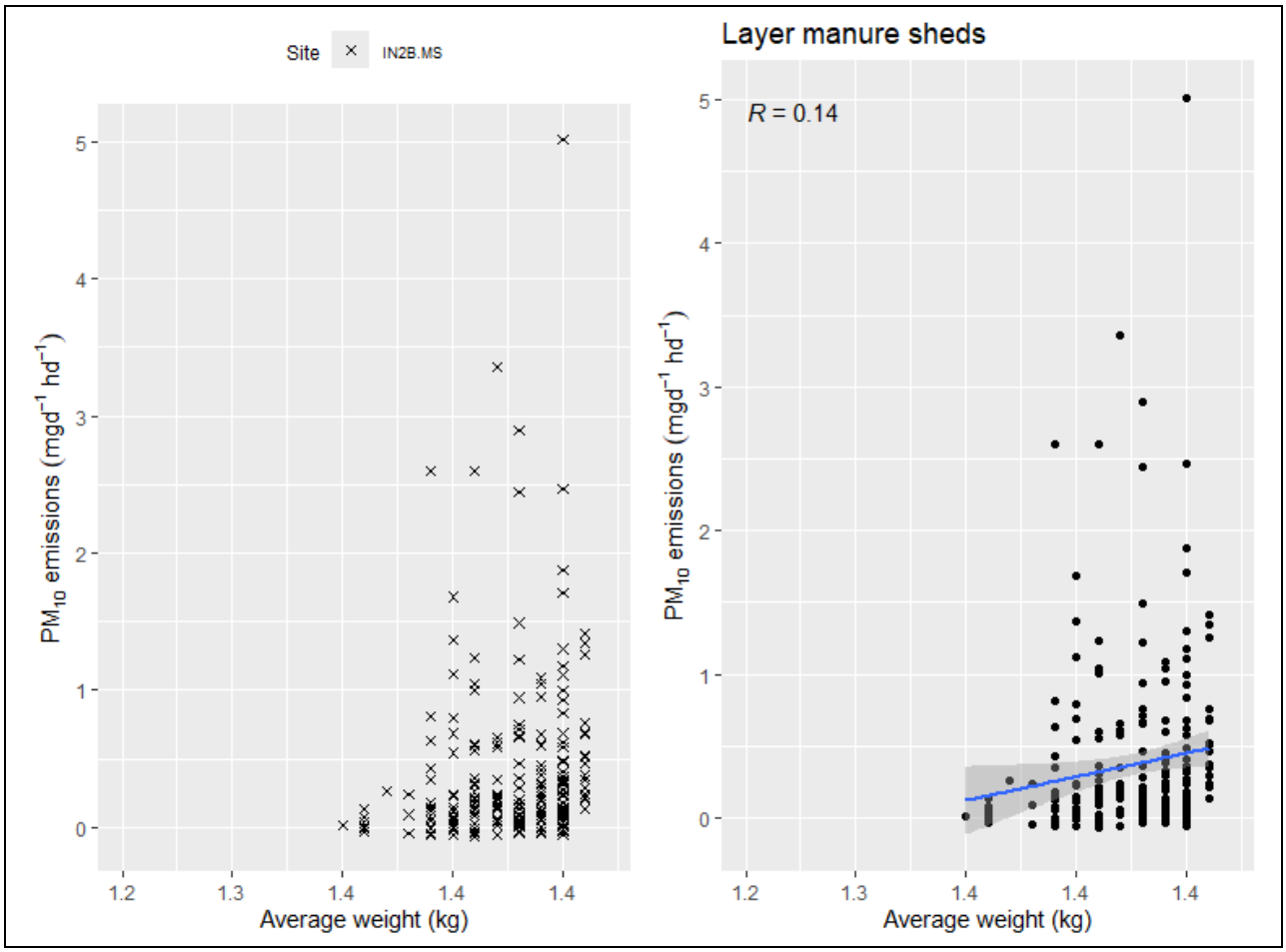

Figure 3.16: Scatter plot of layer manure sheds PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

3.1.3.3 Live animal weight

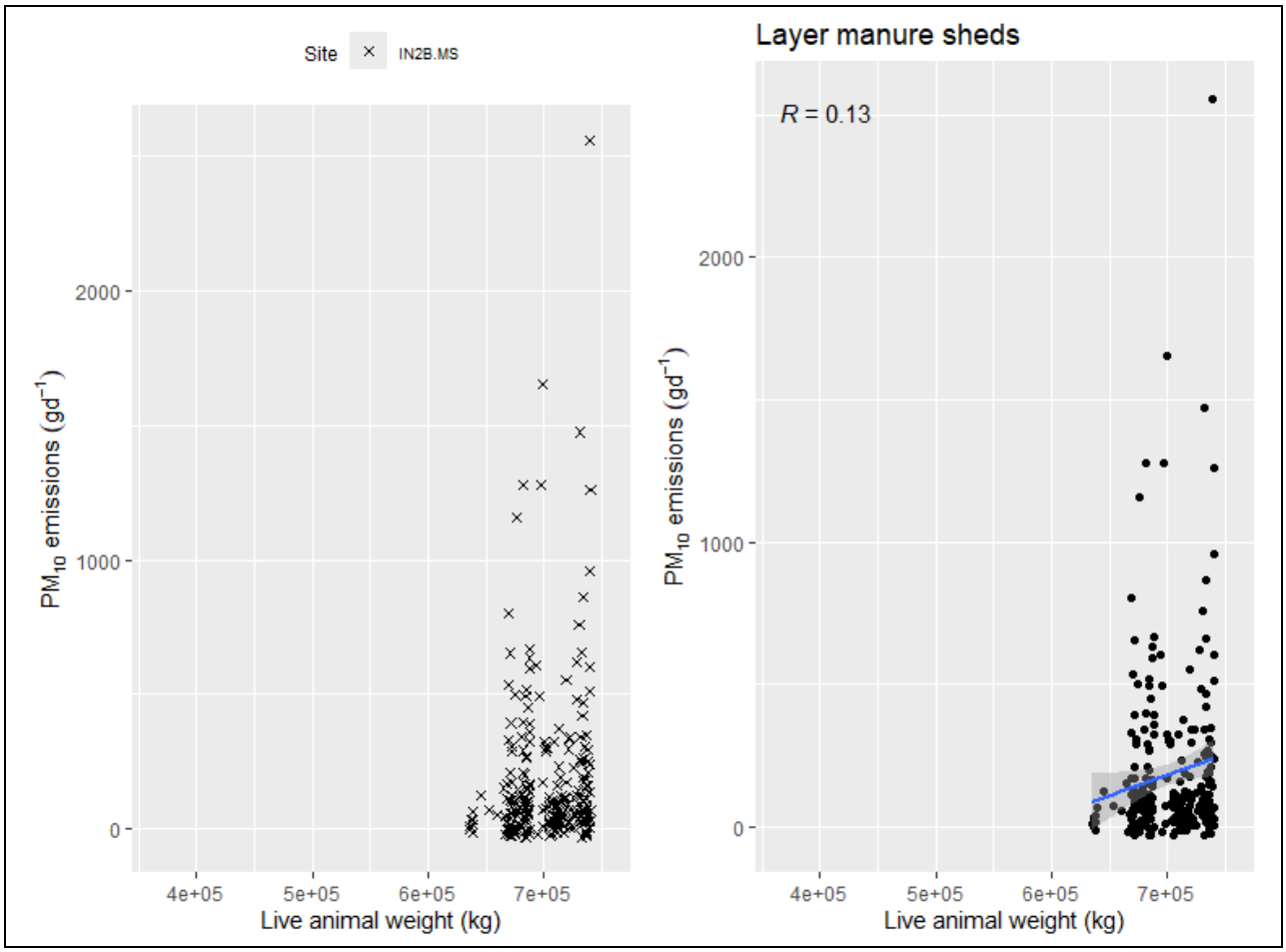

Figure 3.17: Scatter plot of layer manure sheds PM_{10} emissions (g d^{-1}) versus live animal weight.

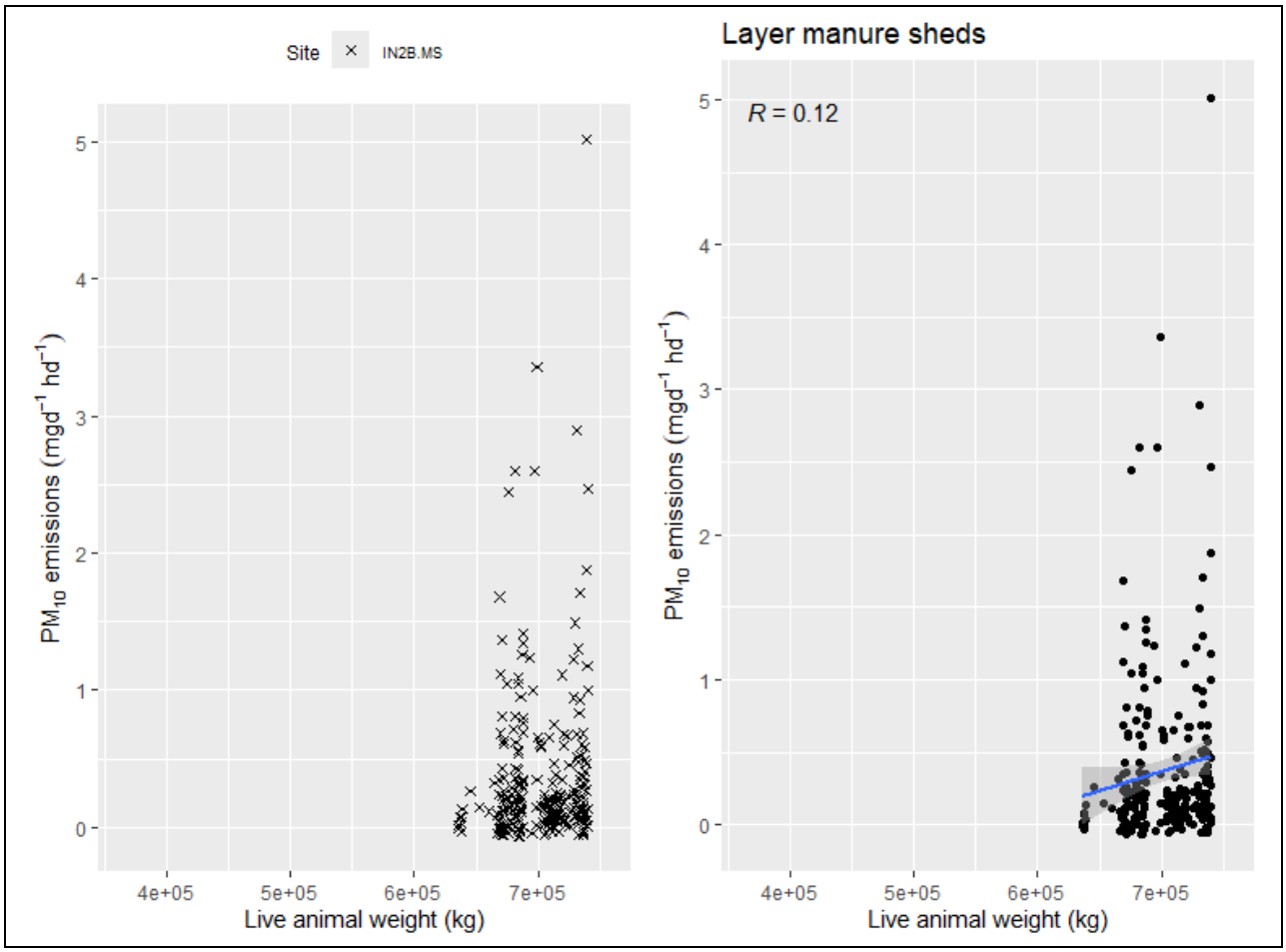

Figure 3.18: Scatter plot of layer manure sheds PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

3.1.4 Particulate Matter ($PM_{2.5}$)

3.1.4.1 Inventory

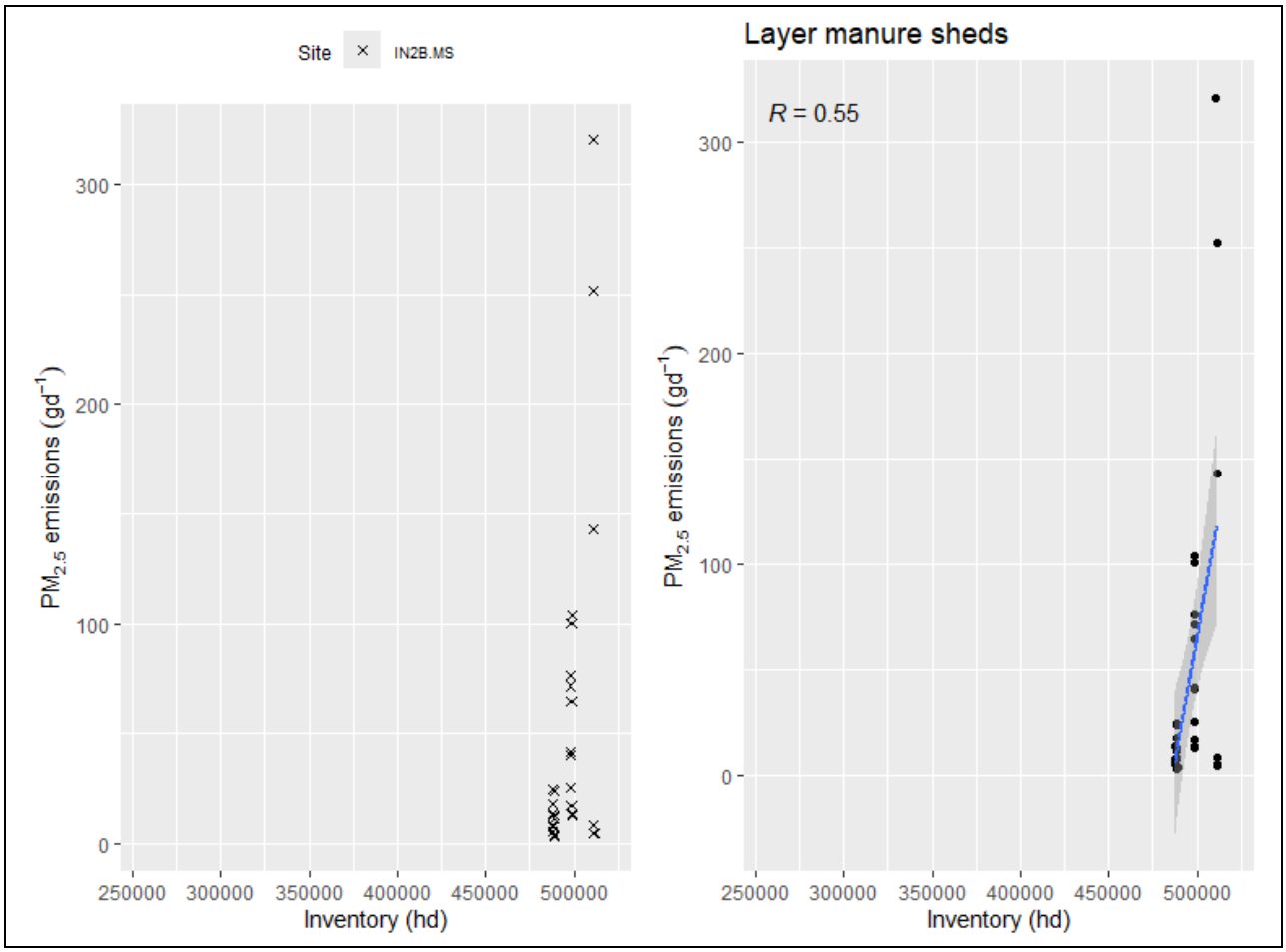

Figure 3.19: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (g d^{-1}) versus Inventory.

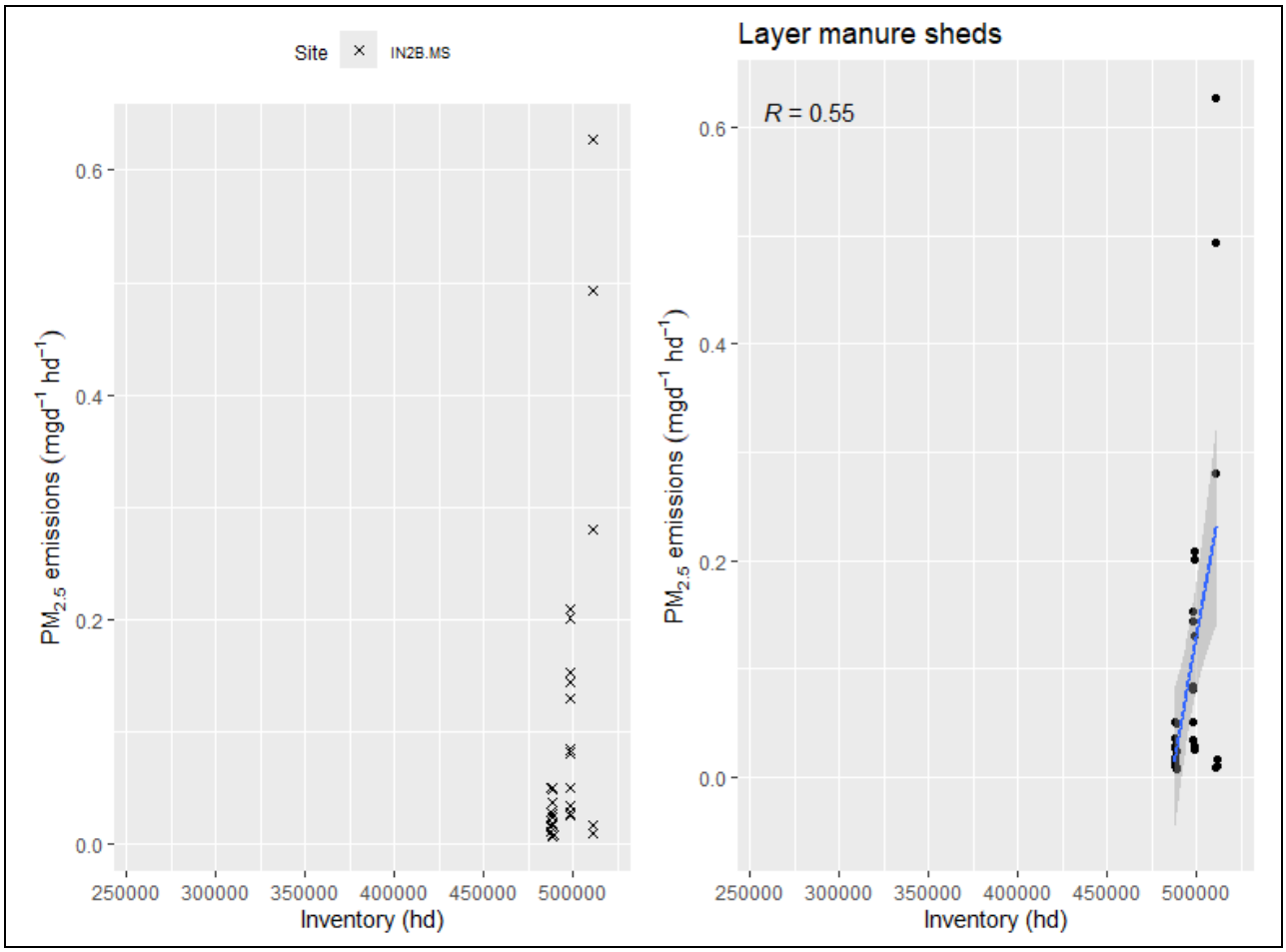

Figure 3.20: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

3.1.4.2 Average animal weight

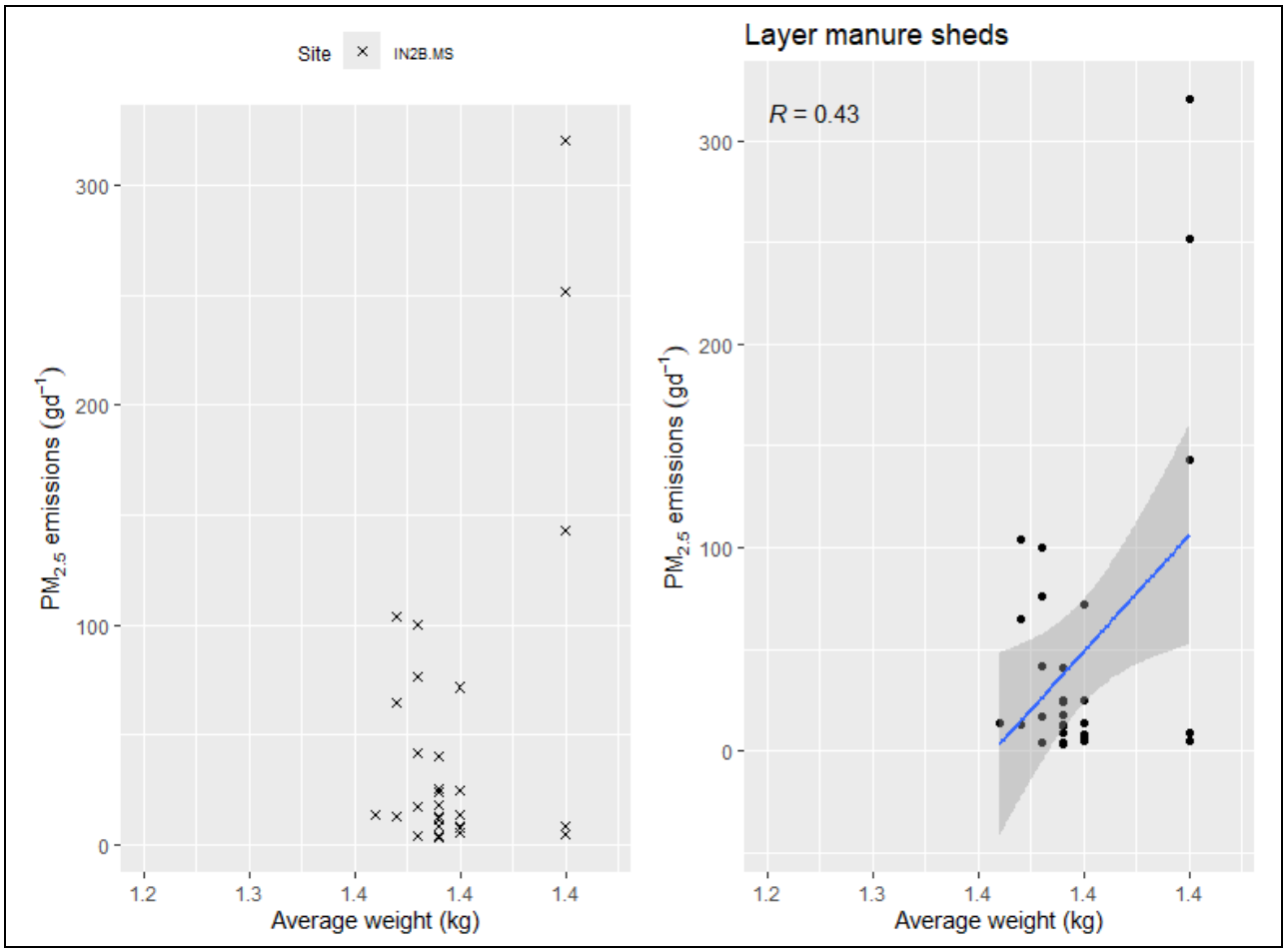

Figure 3.21: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (g d^{-1}) versus average animal weight.

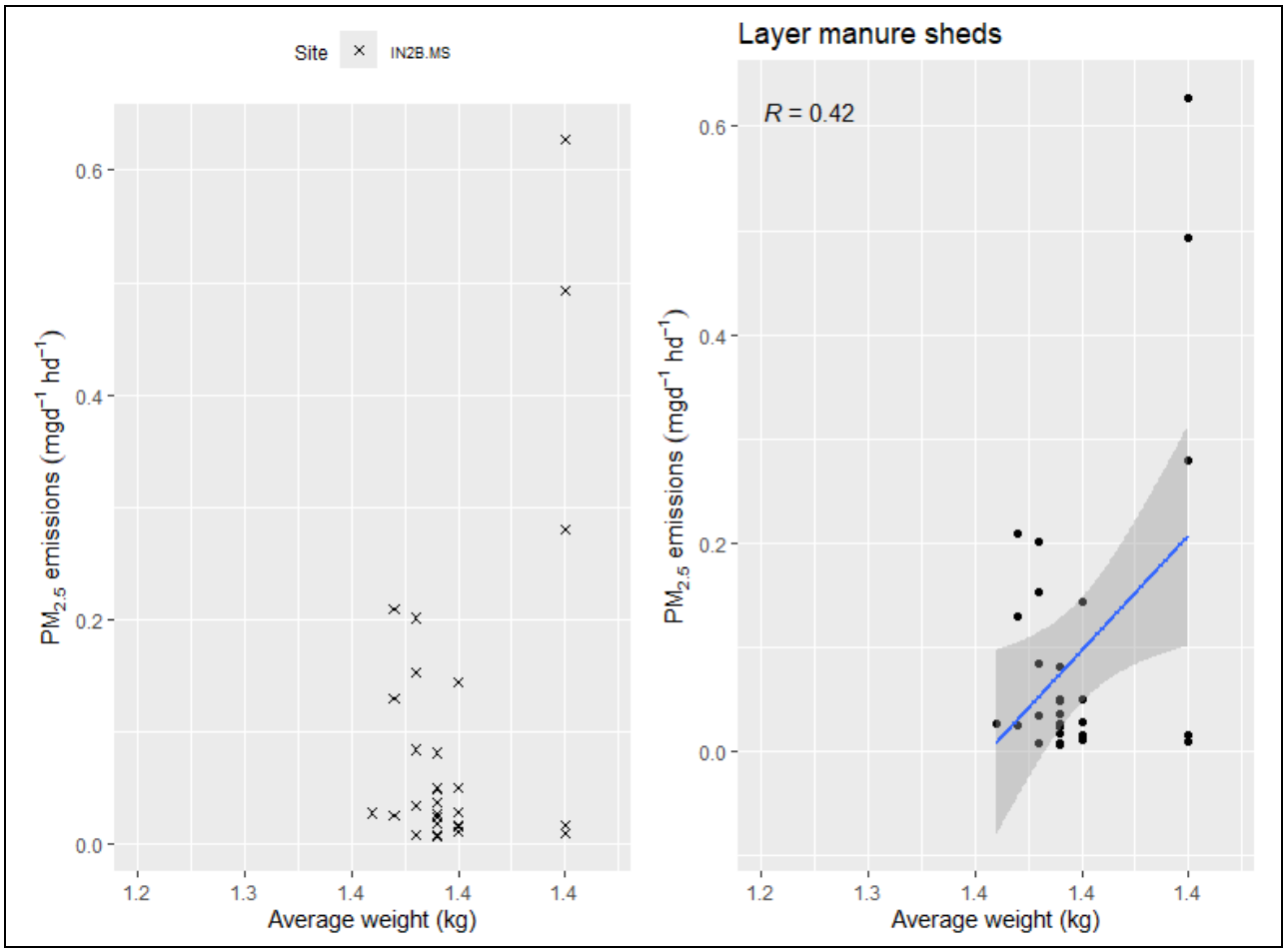

Figure 3.22: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

3.1.4.3 Live animal weight

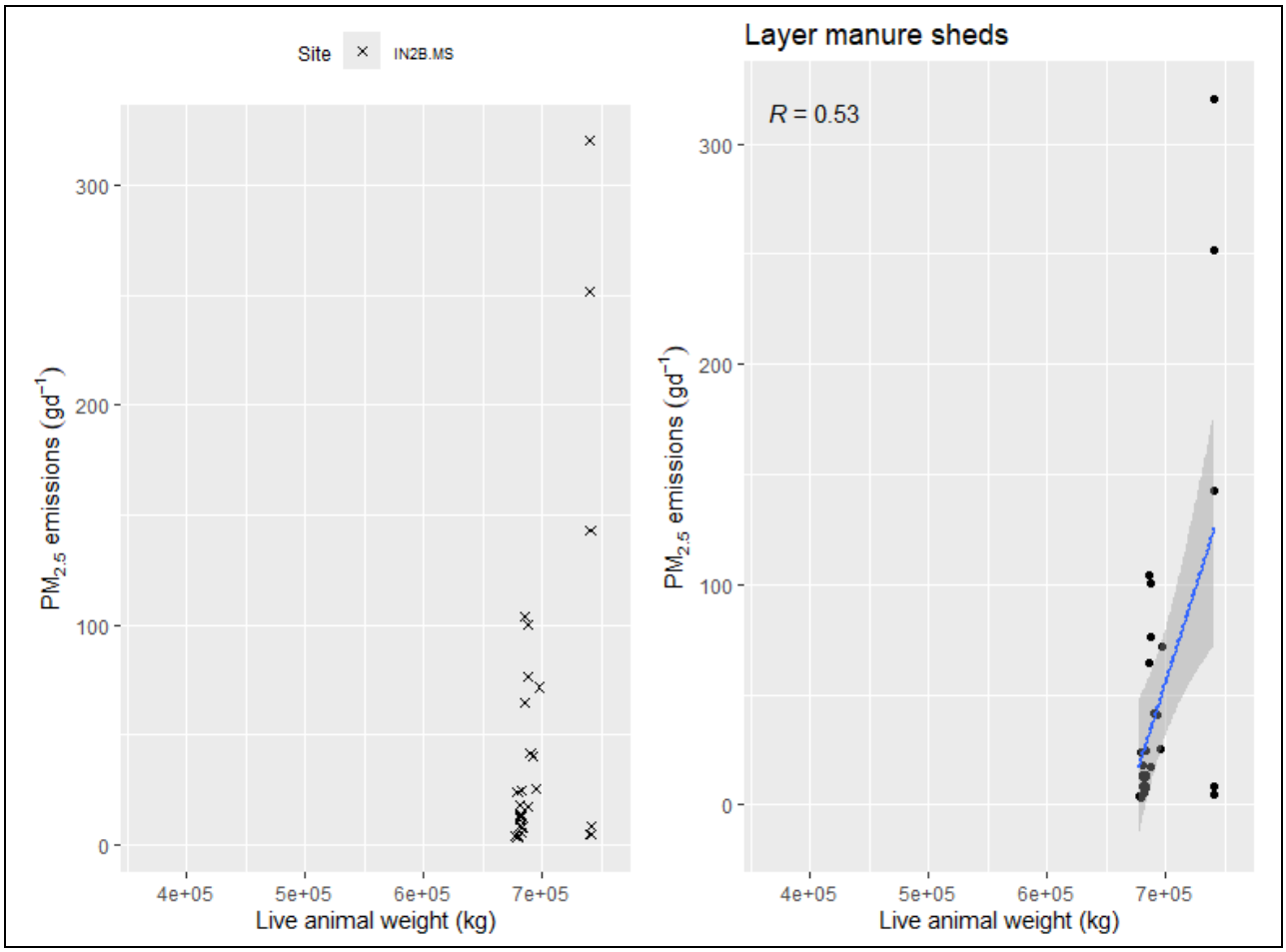

Figure 3.23: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (g d^{-1}) versus live animal weight.

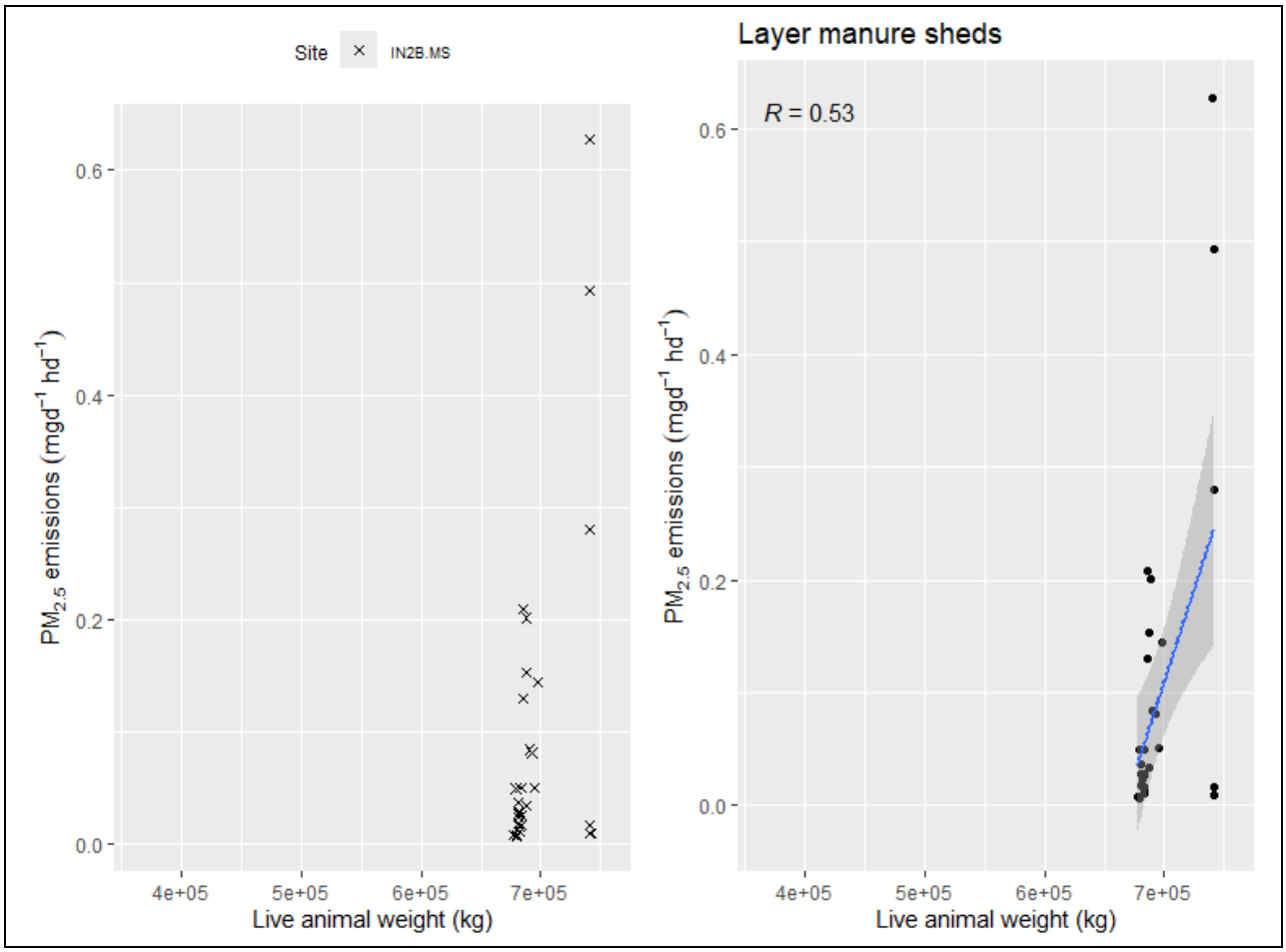

Figure 3.24: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

3.1.5 Total Suspended Particulates (TSP)

3.1.5.1 Inventory

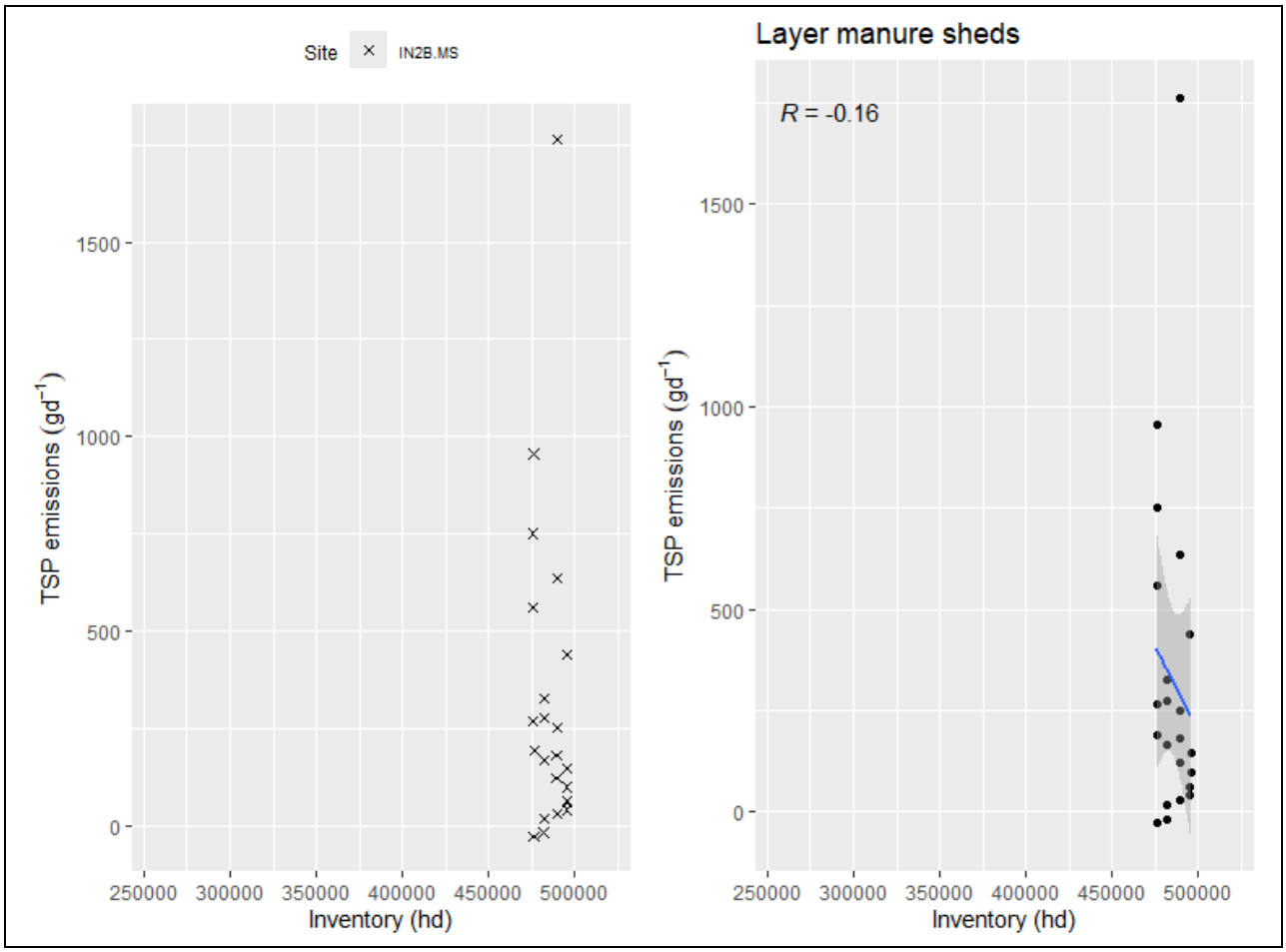

Figure 3.25: Scatter plot of layer manure sheds TSP emissions (g d^{-1}) versus Inventory.

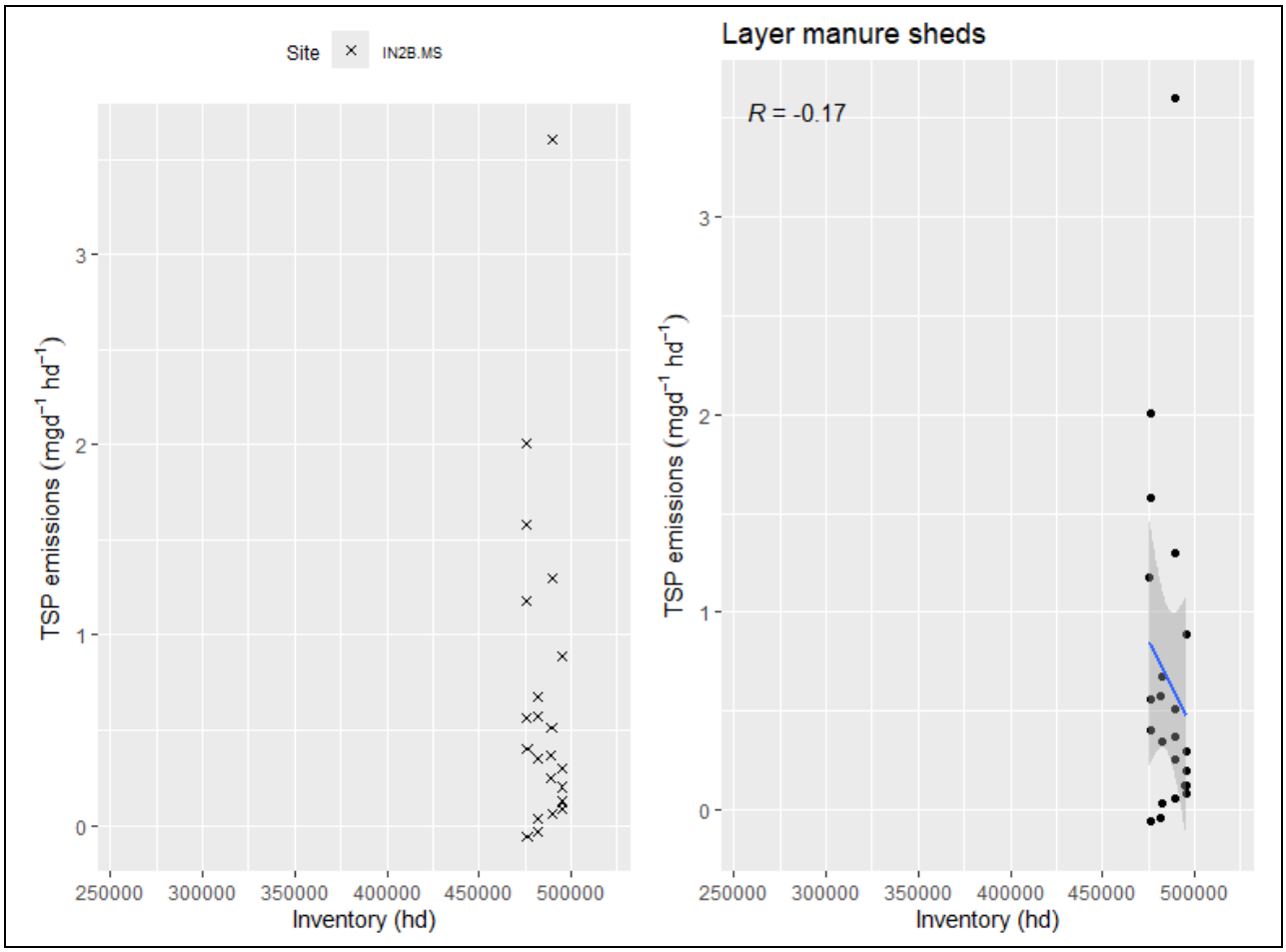

Figure 3.26: Scatter plot of layer manure sheds TSP emissions (mg $d^{-1}hd^{-1}$) versus Inventory.

3.1.5.2 Average animal weight

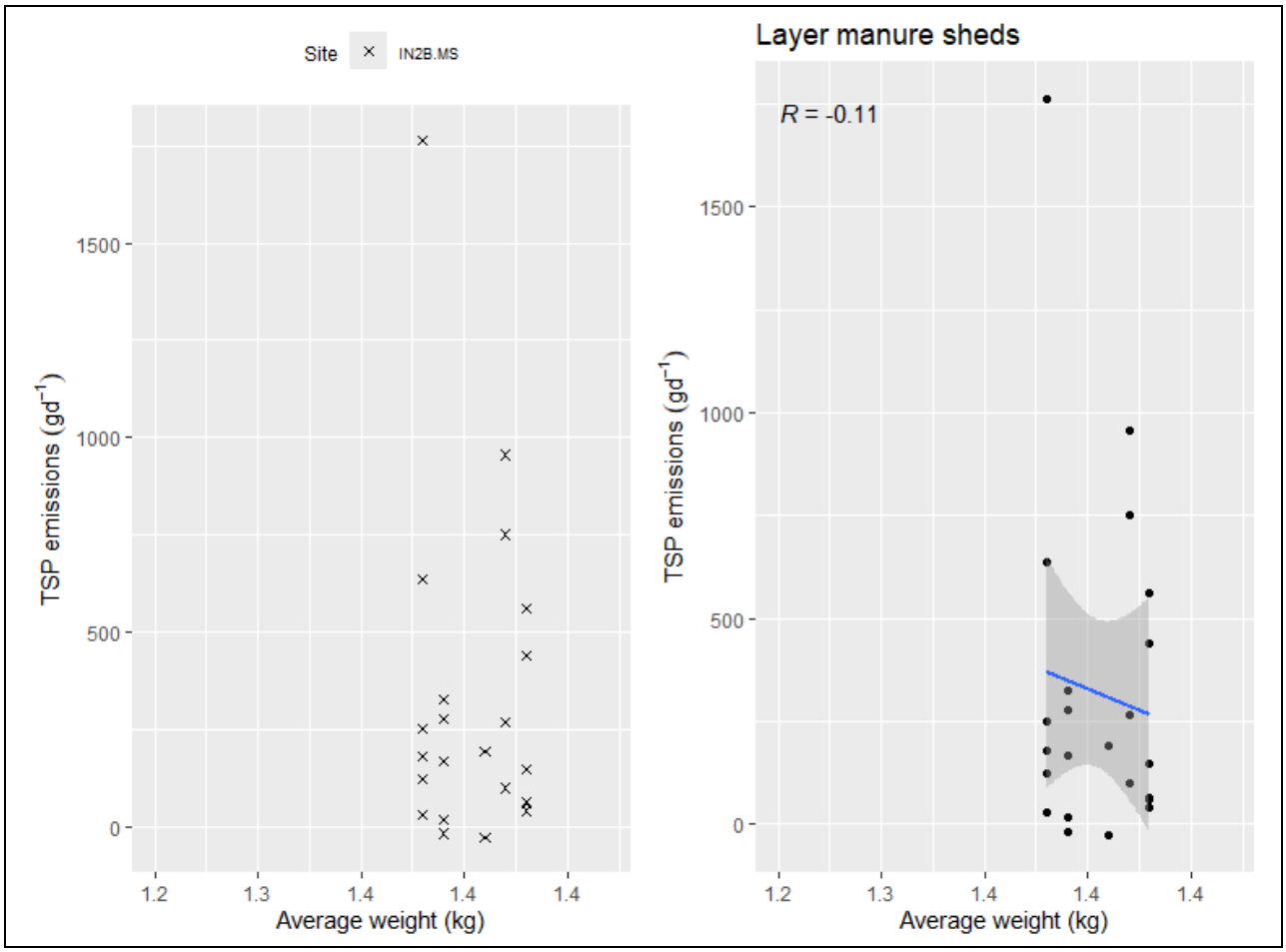

Figure 3.27: Scatter plot of layer manure sheds TSP emissions (g d^{-1}) versus average animal weight.

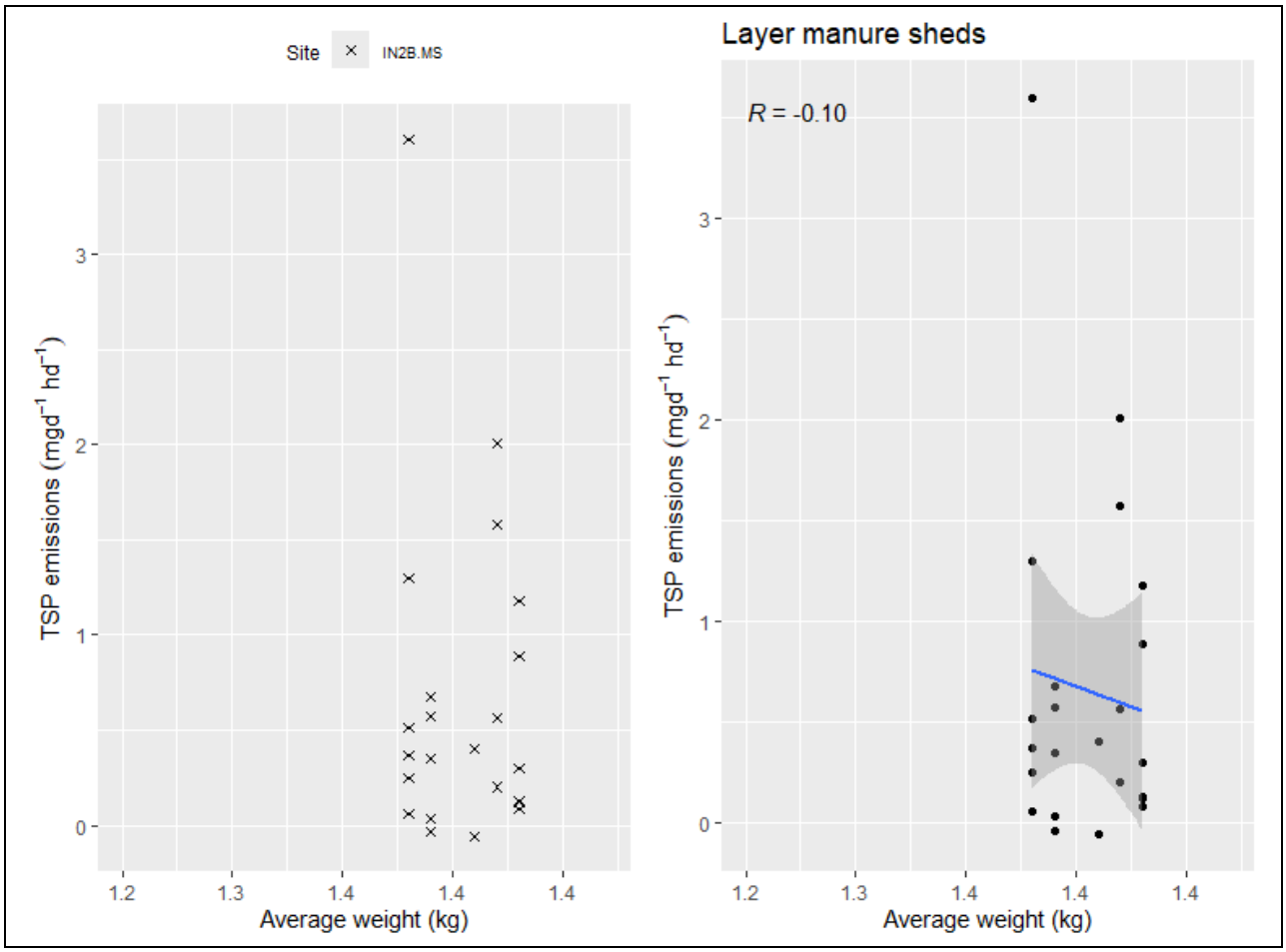

Figure 3.28: Scatter plot of layer manure sheds TSP emissions (mg $d^{-1}hd^{-1}$) versus average animal weight.

3.1.5.3 Live animal weight

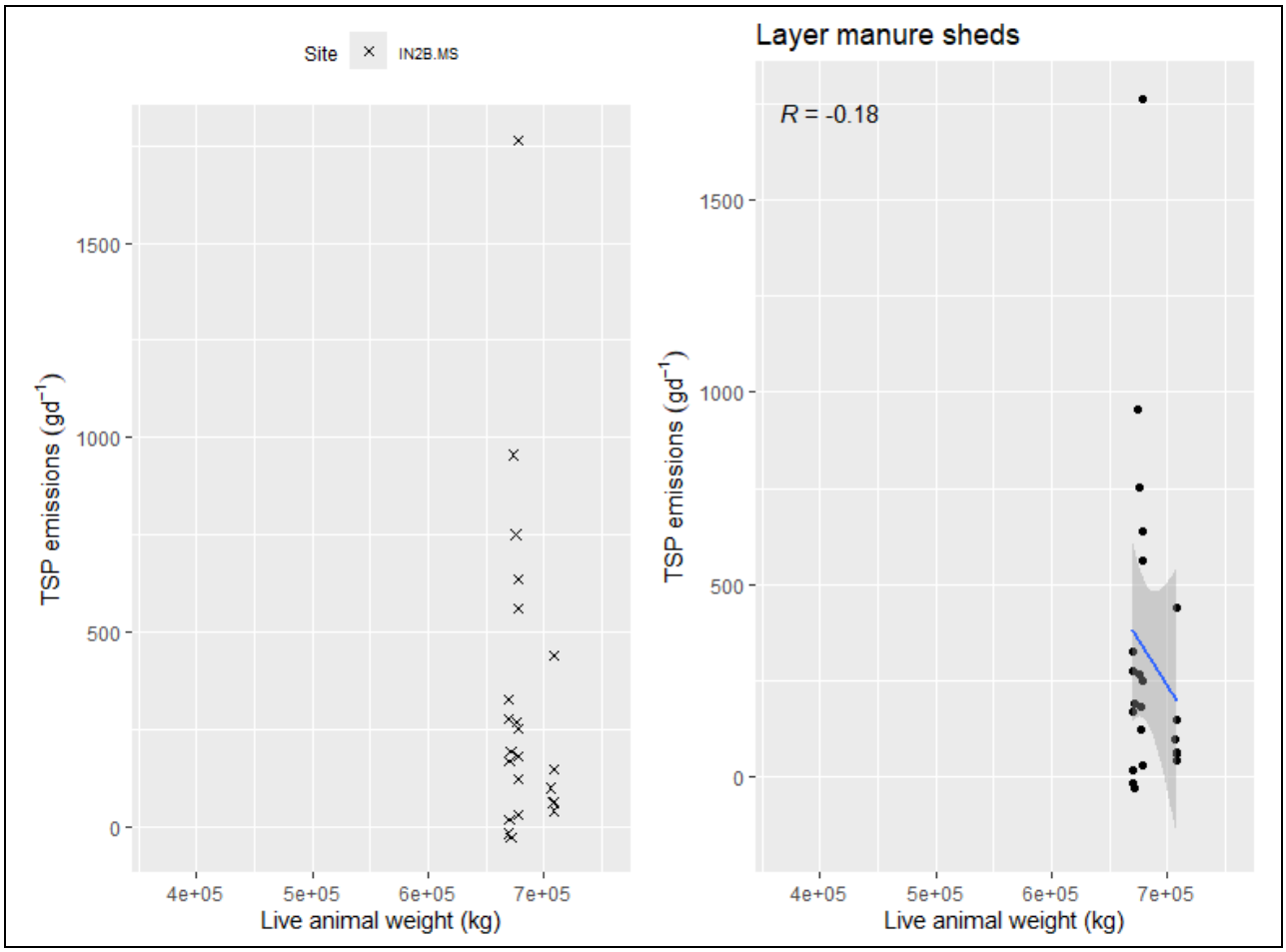

Figure 3.29: Scatter plot of layer manure sheds TSP emissions (g d^{-1}) versus live animal weight.

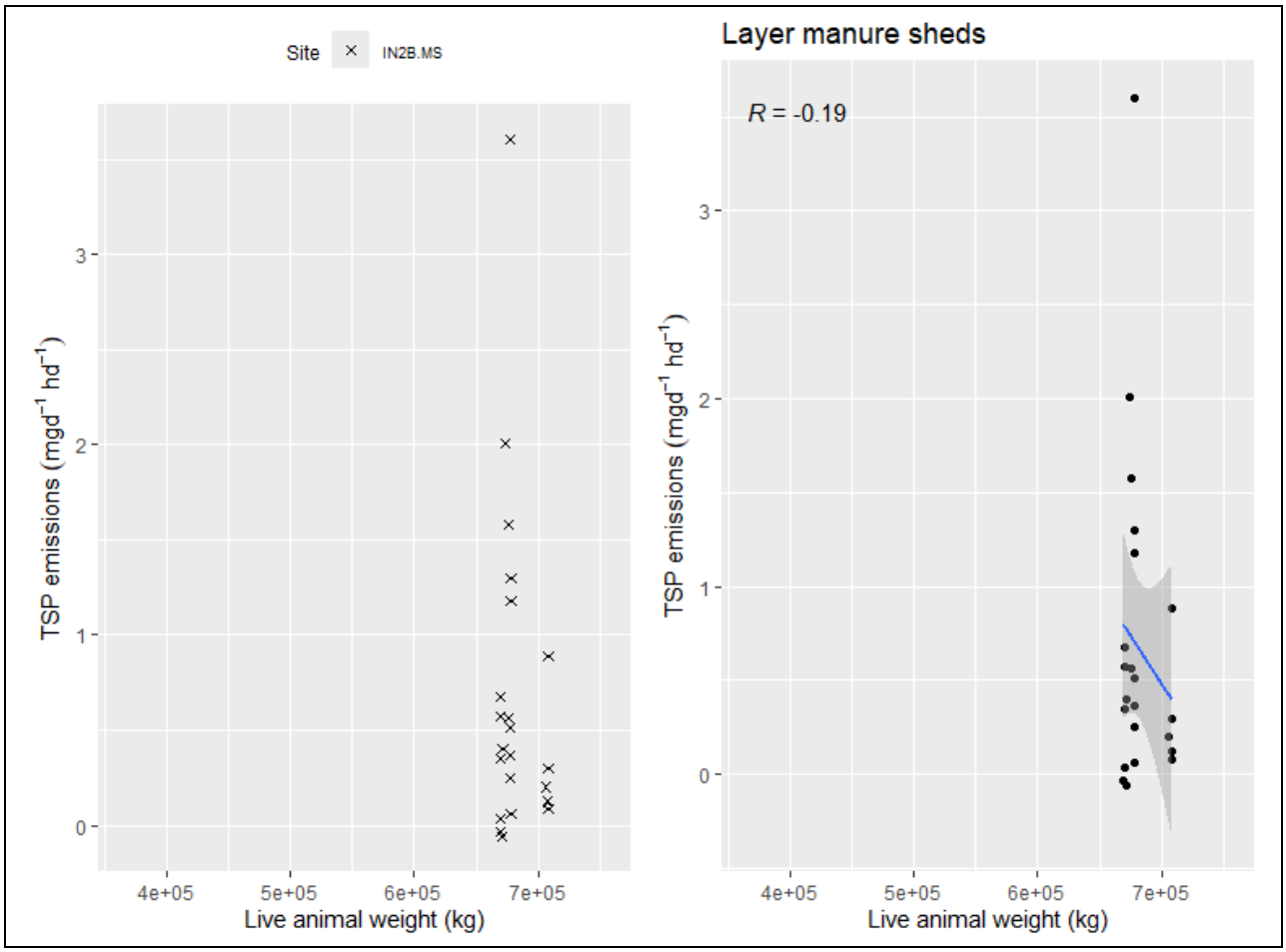

Figure 3.30: Scatter plot of layer manure sheds TSP emissions (mg $d^{-1}hd^{-1}$) versus live animal weight.

3.2 Ambient

Table 3.2: Summary of layer manure sheds R^{-2} values for ambient parameters.

Emissions	Parameter	R	R2	Strength
NH_3 (kgd^{-1})	Ambient Temperature (C)	-0.18	0.03	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Ambient Temperature (C)	-0.19	0.03	slight or weak
NH_3 (kgd^{-1})	Ambient Relative humidity (%)	0.08	0.01	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.08	0.01	slight or weak
NH_3 (kgd^{-1})	Wind speed (ms^{-1})	0.04	0	slight or weak
NH_3 ($gd^{-1}hd^{-1}$)	Wind speed (ms^{-1})	0.04	0	slight or weak
H_2S (gd^{-1})	Ambient Temperature (C)	-0.28	0.08	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	-0.29	0.08	slight or weak
H_2S (gd^{-1})	Ambient Relative humidity (%)	0.14	0.02	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.15	0.02	slight or weak
H_2S (gd^{-1})	Wind speed (ms^{-1})	0.05	0	slight or weak
H_2S ($mgd^{-1}hd^{-1}$)	Wind speed (ms^{-1})	0.04	0	slight or weak
PM_{10} (gd^{-1})	Ambient Temperature (C)	0.1	0.01	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.1	0.01	slight or weak
PM_{10} (gd^{-1})	Ambient Relative humidity (%)	-0.12	0.02	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	-0.12	0.01	slight or weak
PM_{10} (gd^{-1})	Wind speed (ms^{-1})	-0.01	0	slight or weak
PM_{10} ($mgd^{-1}hd^{-1}$)	Wind speed (ms^{-1})	-0.02	0	slight or weak
$PM_{2.5}$ (gd^{-1})	Ambient Temperature (C)	-0.06	0	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	-0.07	0	slight or weak
$PM_{2.5}$ (gd^{-1})	Ambient Relative humidity (%)	-0.41	0.17	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	-0.41	0.17	slight or weak
$PM_{2.5}$ (gd^{-1})	Wind speed (ms^{-1})	0.09	0.01	slight or weak
$PM_{2.5}$ ($mgd^{-1}hd^{-1}$)	Wind speed (ms^{-1})	0.09	0.01	slight or weak
TSP (gd^{-1})	Ambient Temperature (C)	0.03	0	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Ambient Temperature (C)	0.03	0	slight or weak
TSP (gd^{-1})	Ambient Relative humidity (%)	0.1	0.01	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Ambient Relative humidity (%)	0.11	0.01	slight or weak
TSP (gd^{-1})	Wind speed (ms^{-1})	0.04	0	slight or weak
TSP ($mgd^{-1}hd^{-1}$)	Wind speed (ms^{-1})	0.03	0	slight or weak

3.2.1 Ammonia (NH_3)

3.2.1.1 Ambient temperature

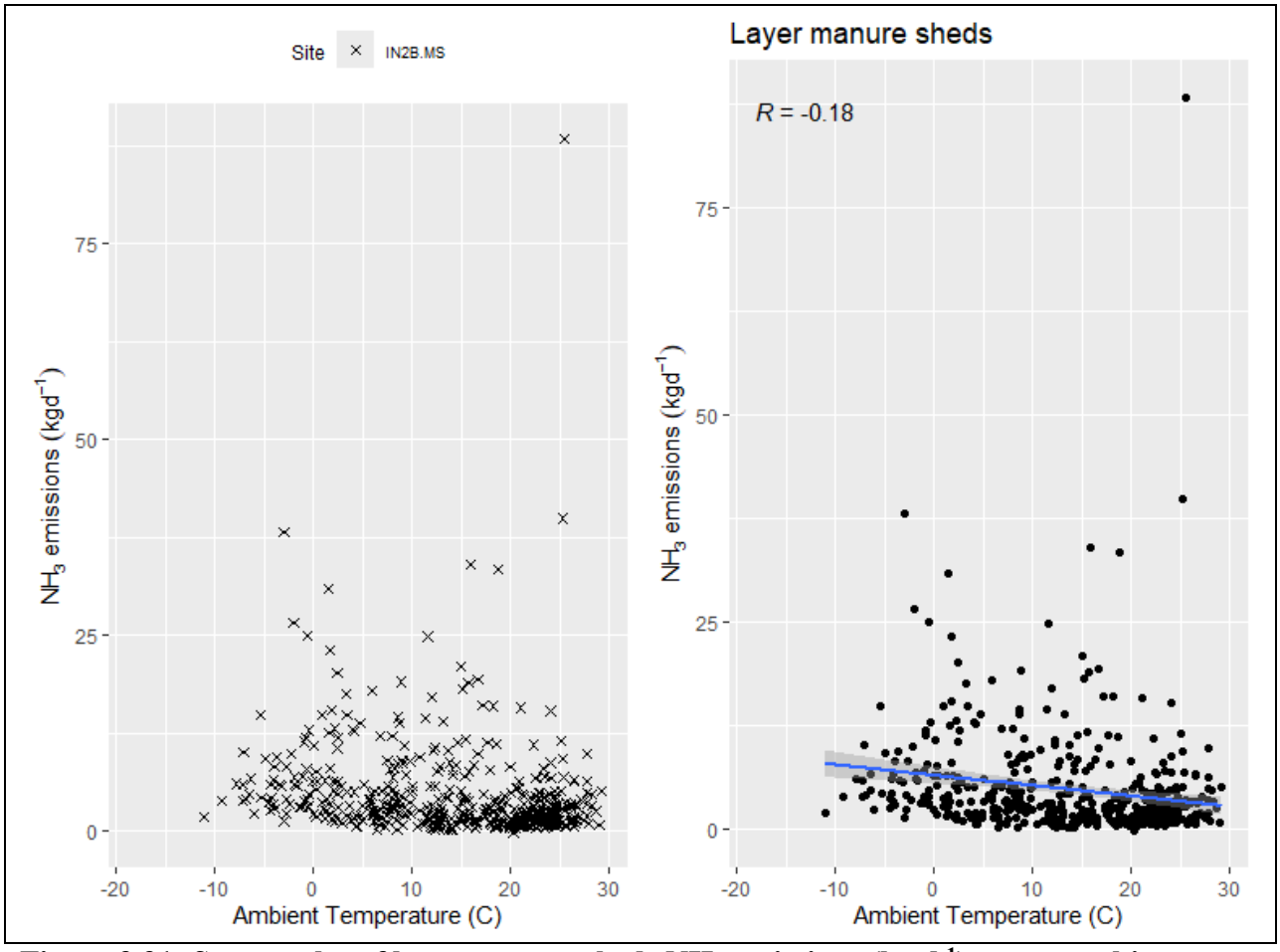

Figure 3.31: Scatter plot of layer manure sheds NH_3 emissions (kg d^{-1}) versus ambient temperature.

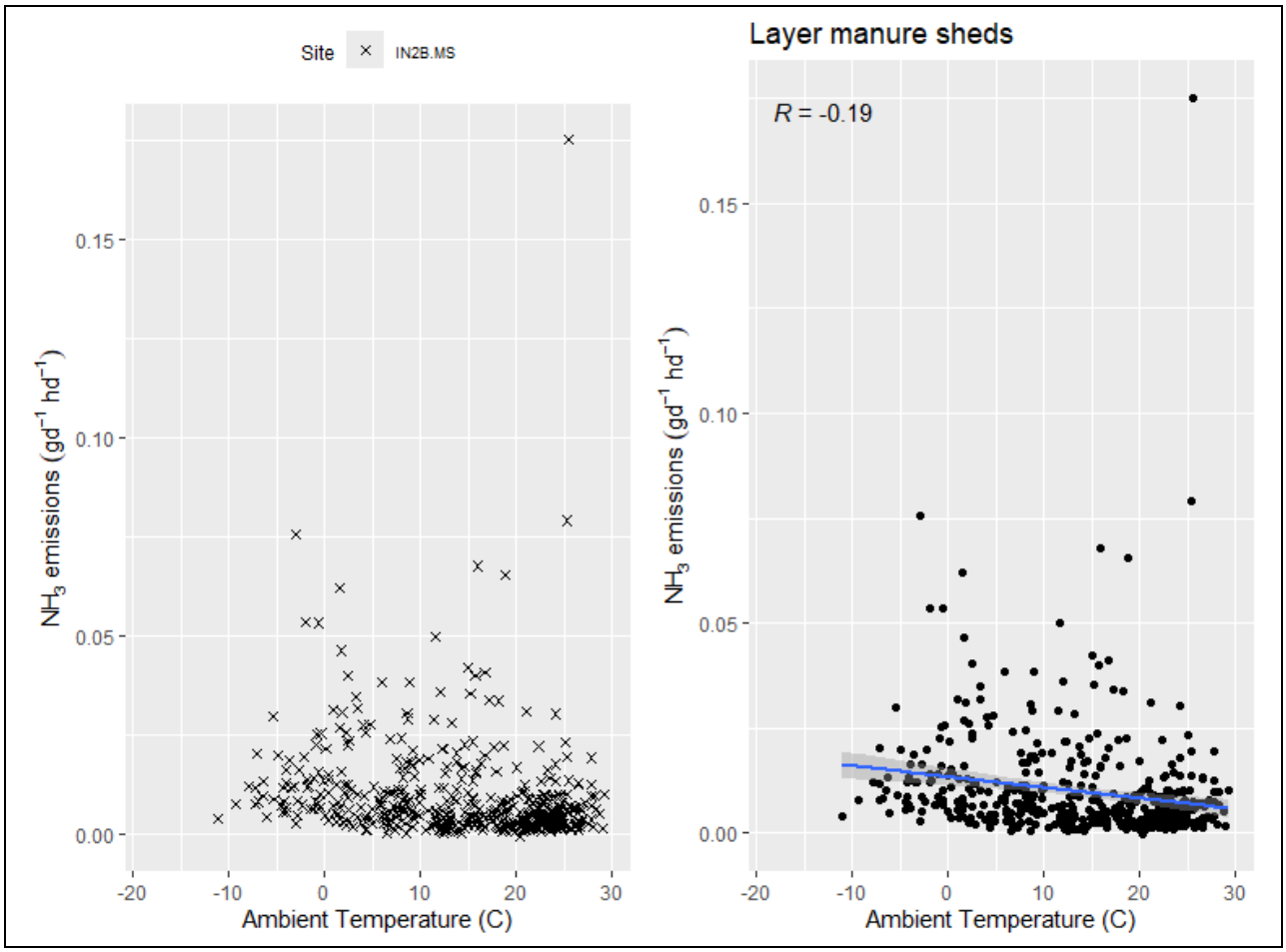

Figure 3.32: Scatter plot of layer manure sheds NH_3 emissions (g $d^{-1}hd^{-1}$) versus ambient temperature.

3.2.1.2 Ambient relative humidity

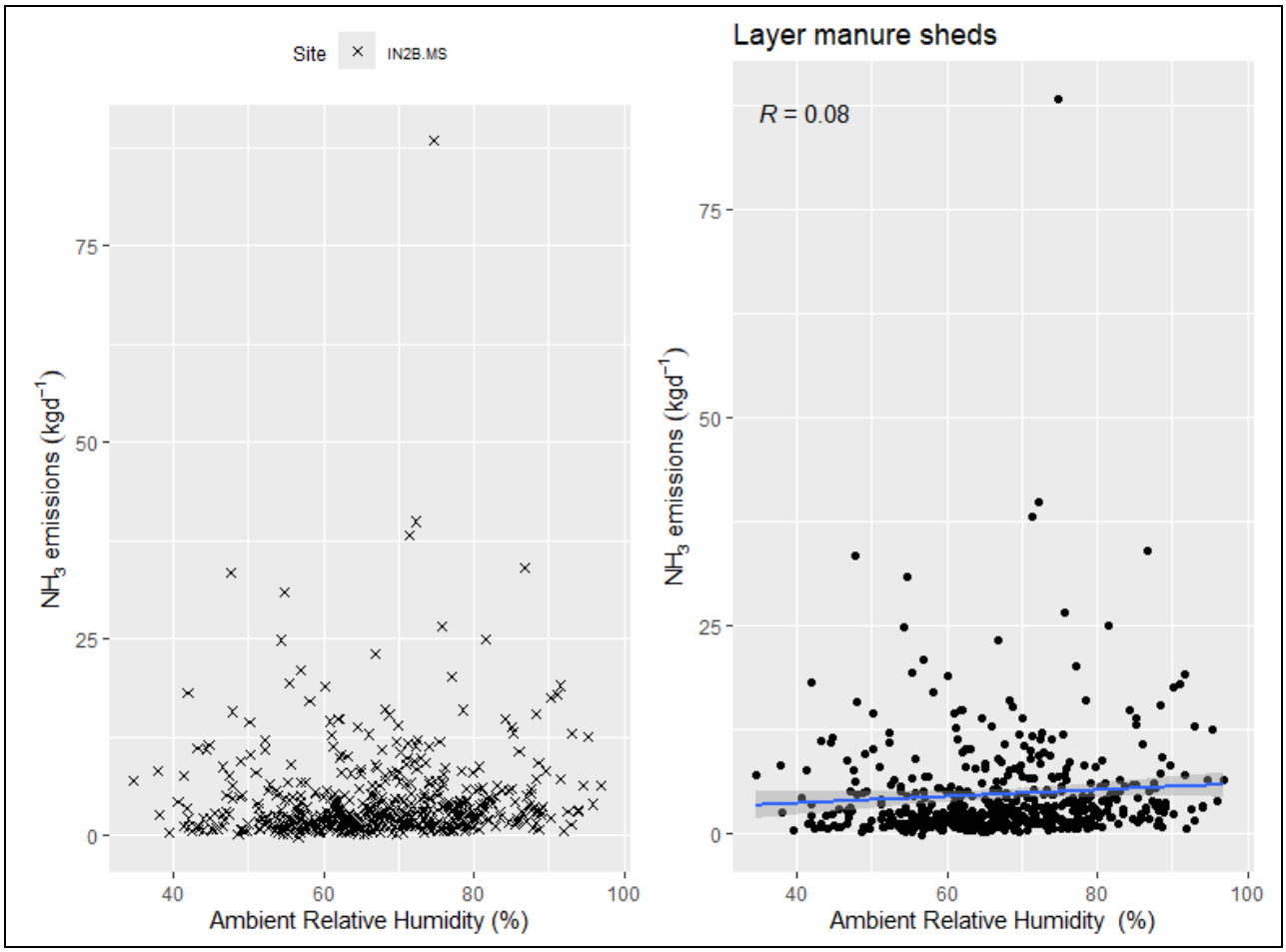

Figure 3.33: Scatter plot of layer manure sheds NH_3 emissions (kg d^{-1}) versus ambient relative humidity.

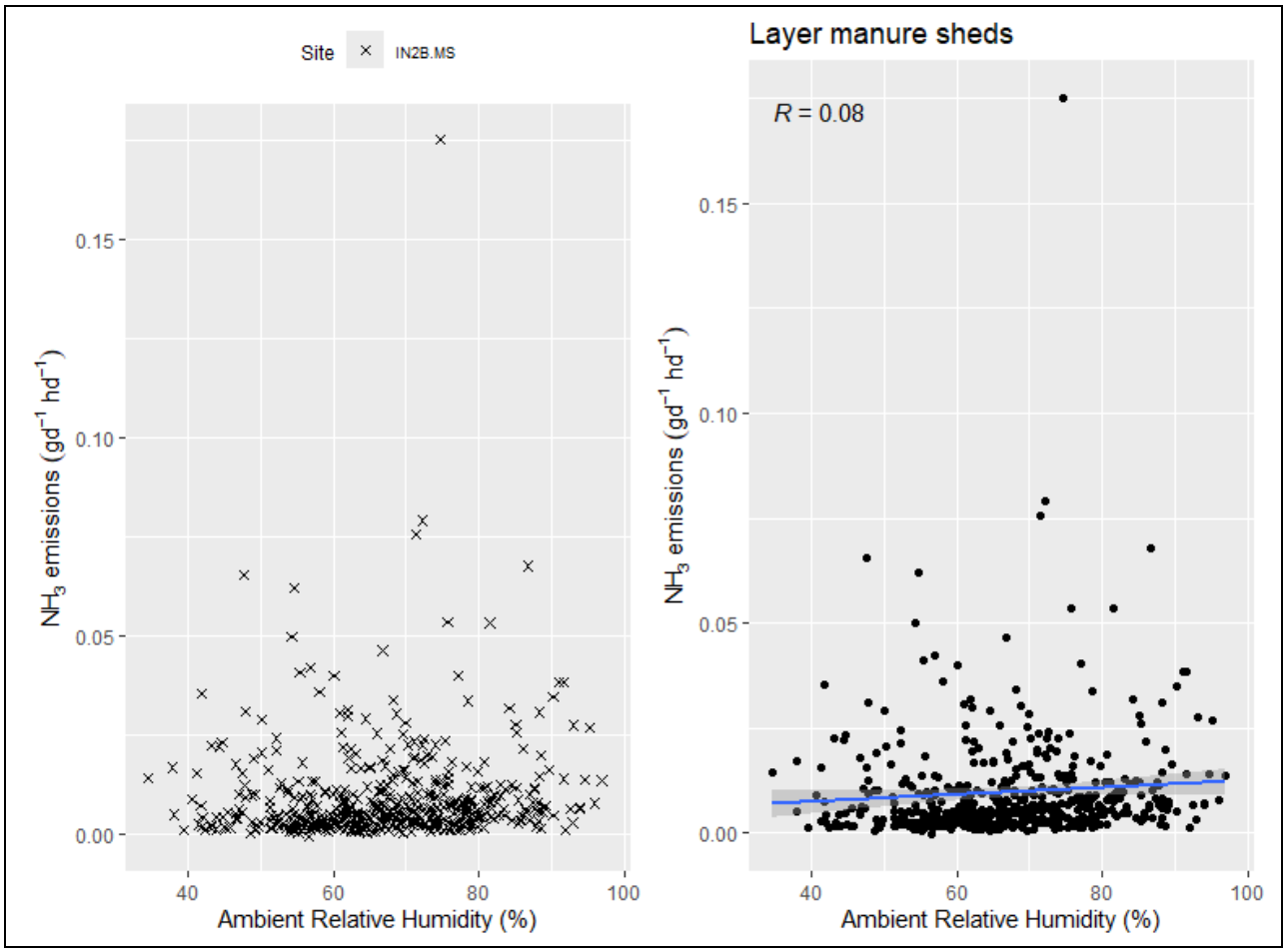

Figure 3.34: Scatter plot of layer manure sheds NH_3 emissions (g $d^{-1}hd^{-1}$) versus ambient relative humidity.

3.2.1.3 Air pressure

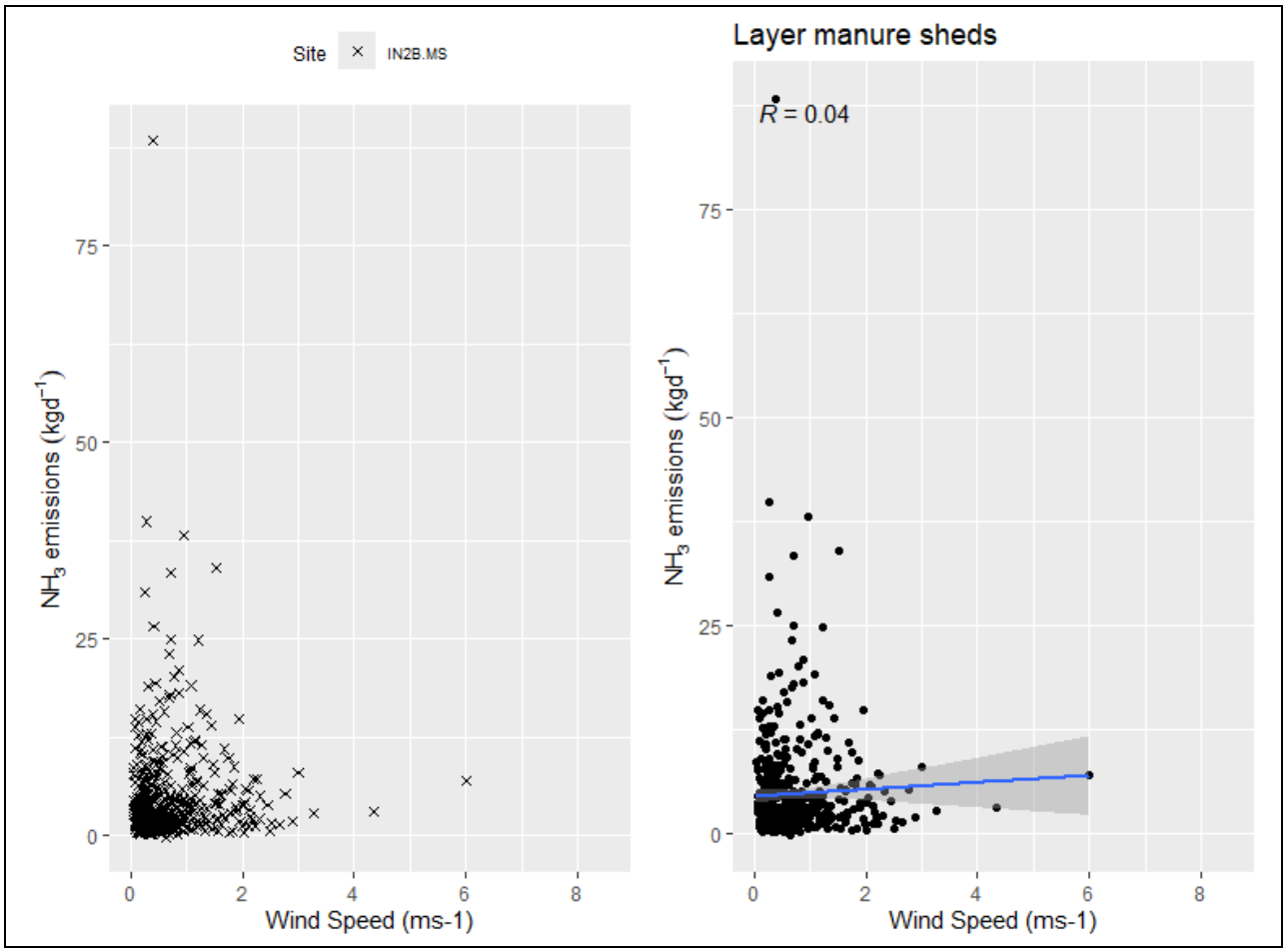

Figure 3.35: Scatter plot of layer manure sheds NH_3 emissions (kg d^{-1}) versus wind speed.

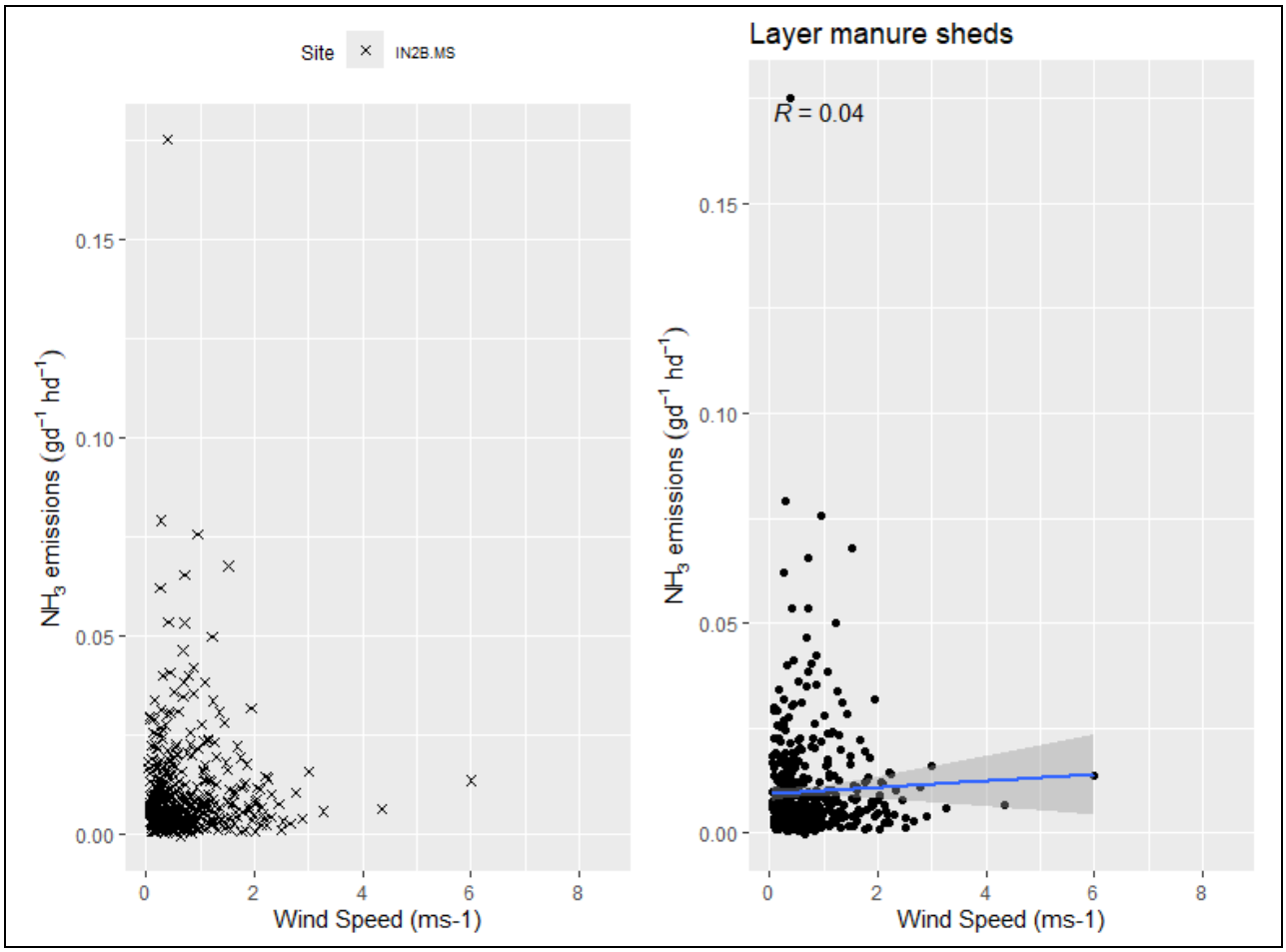

Figure 3.36: Scatter plot of layer manure sheds NH_3 emissions (g $d^{-1}hd^{-1}$) versus wind speed.

3.2.2 Hydrogen Sulfide (H_2S)

3.2.2.1 Ambient temperature

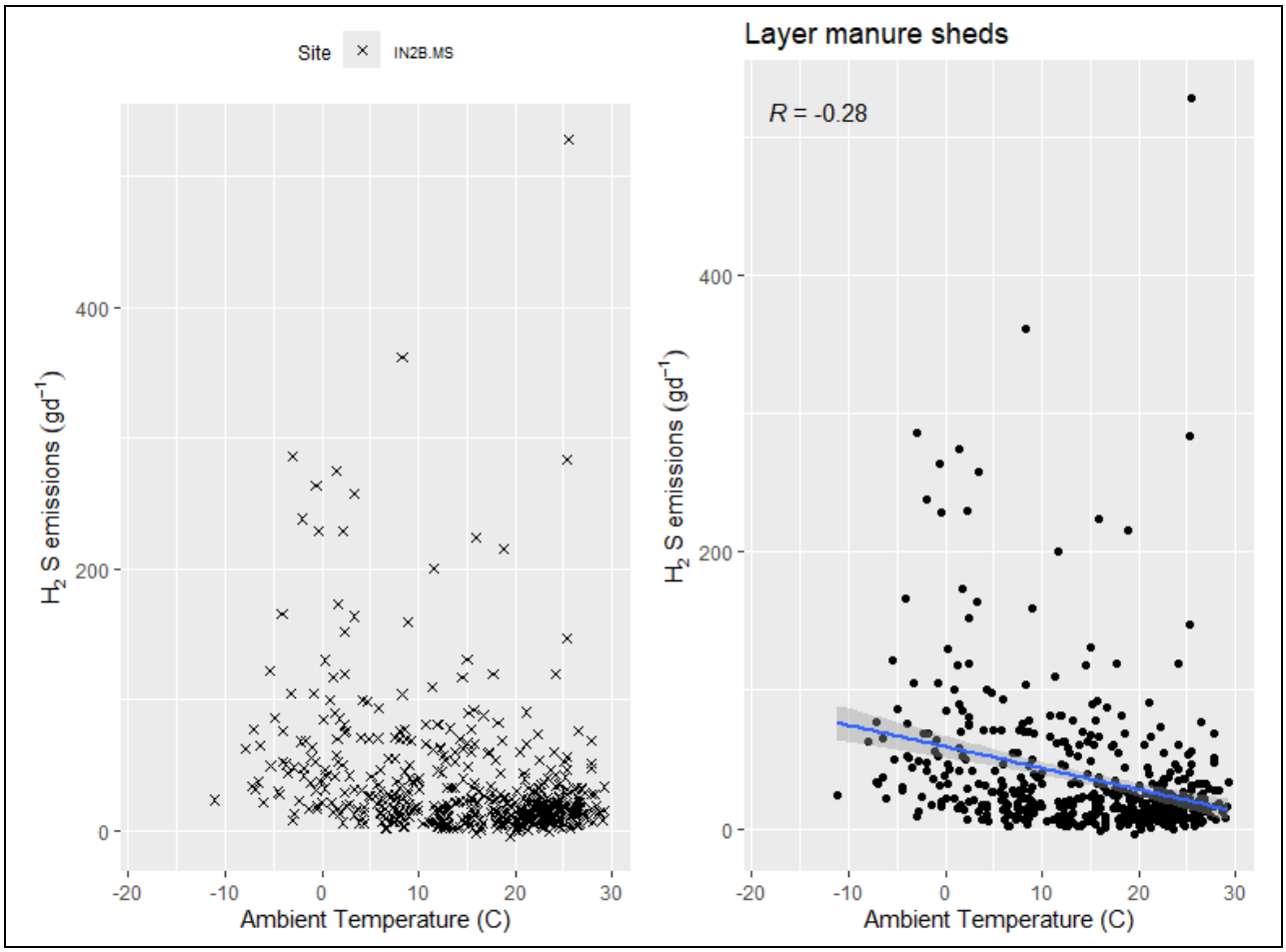

Figure 3.37: Scatter plot of layer manure sheds H_2S emissions (g d^{-1}) versus ambient temperature.

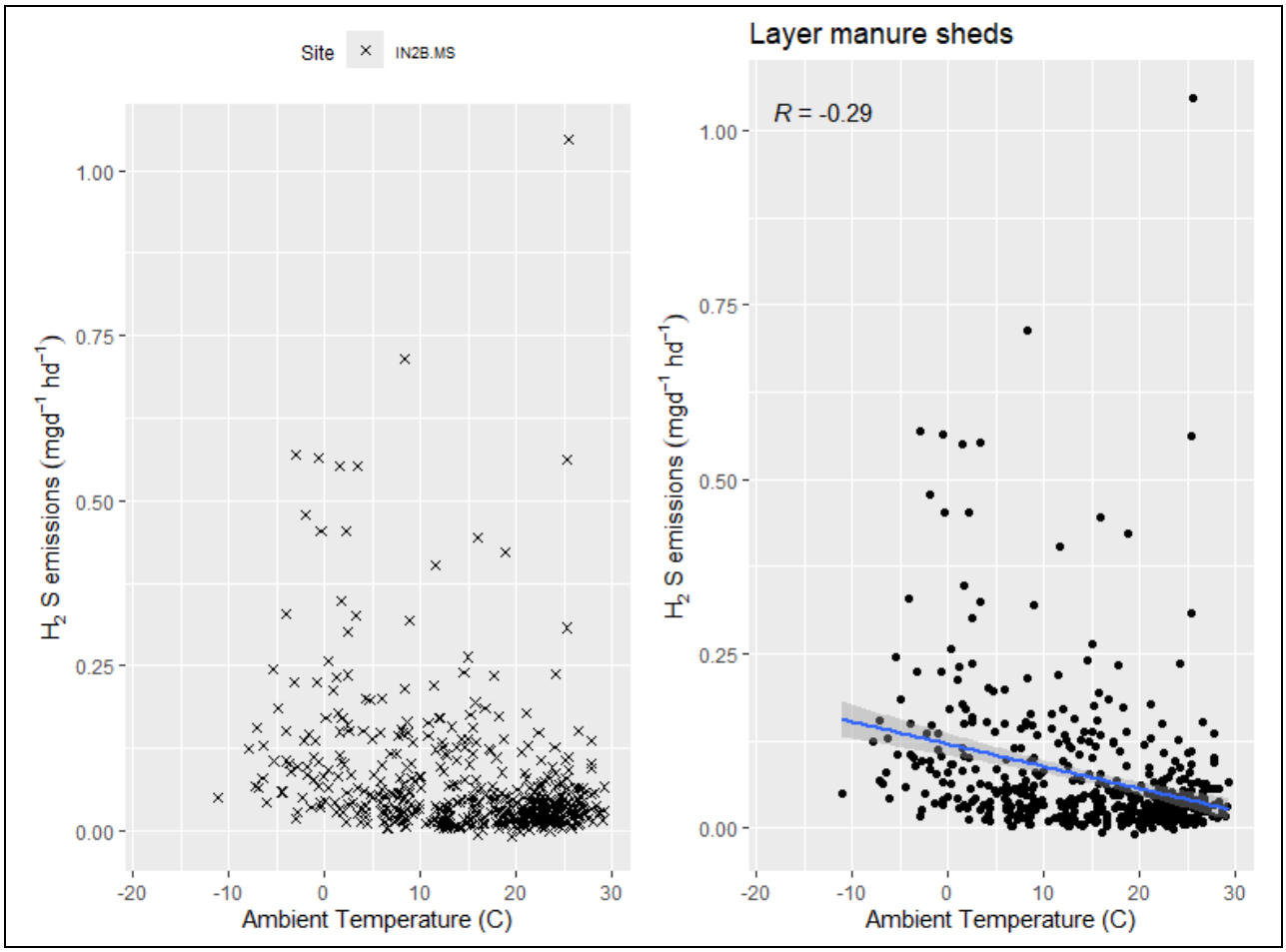

Figure 3.38: Scatter plot of layer manure sheds H_2S emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

3.2.2.2 *Ambient relative humidity*

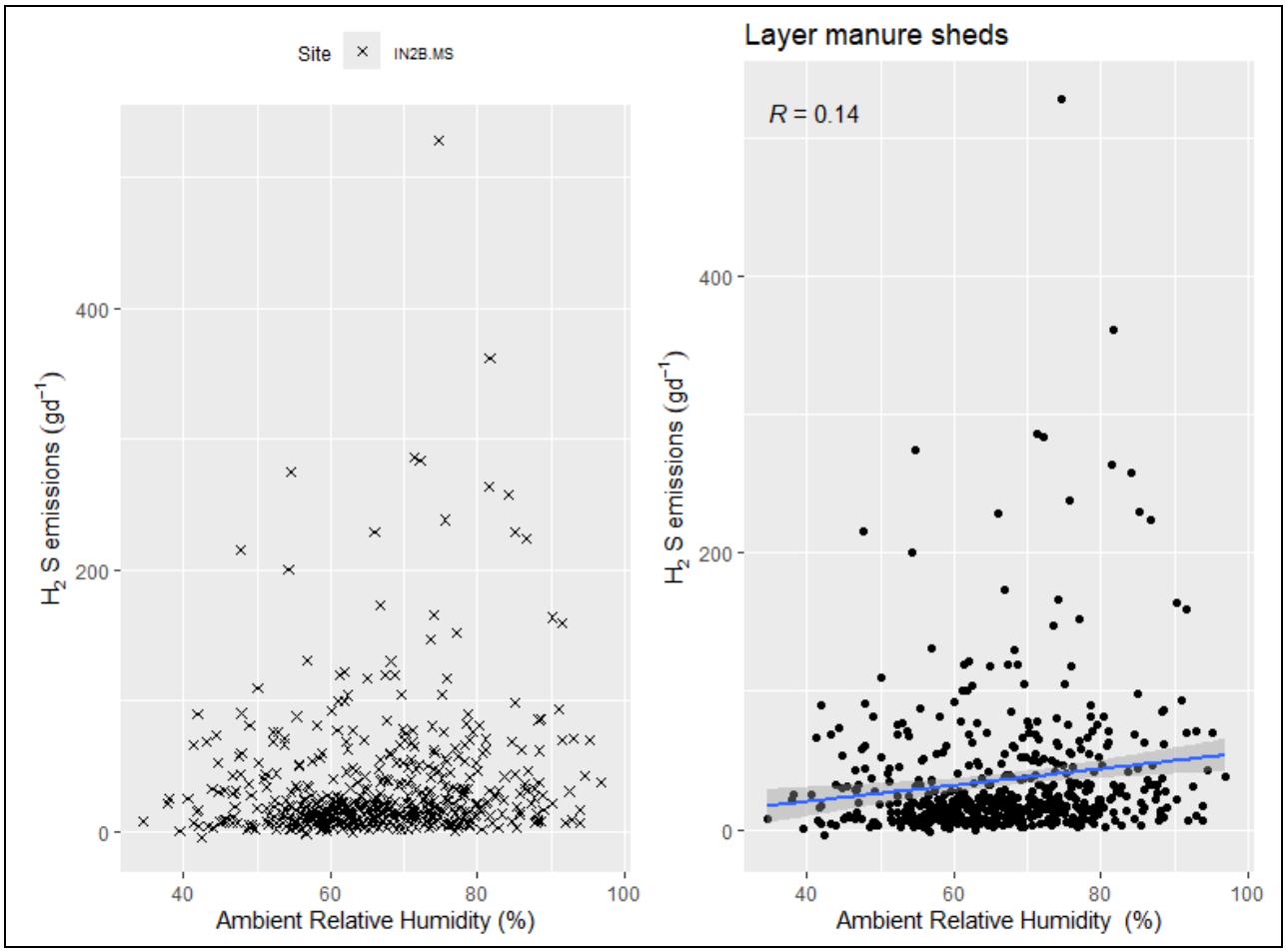

Figure 3.39: Scatter plot of layer manure sheds H_2S emissions (g d^{-1}) versus ambient relative humidity.

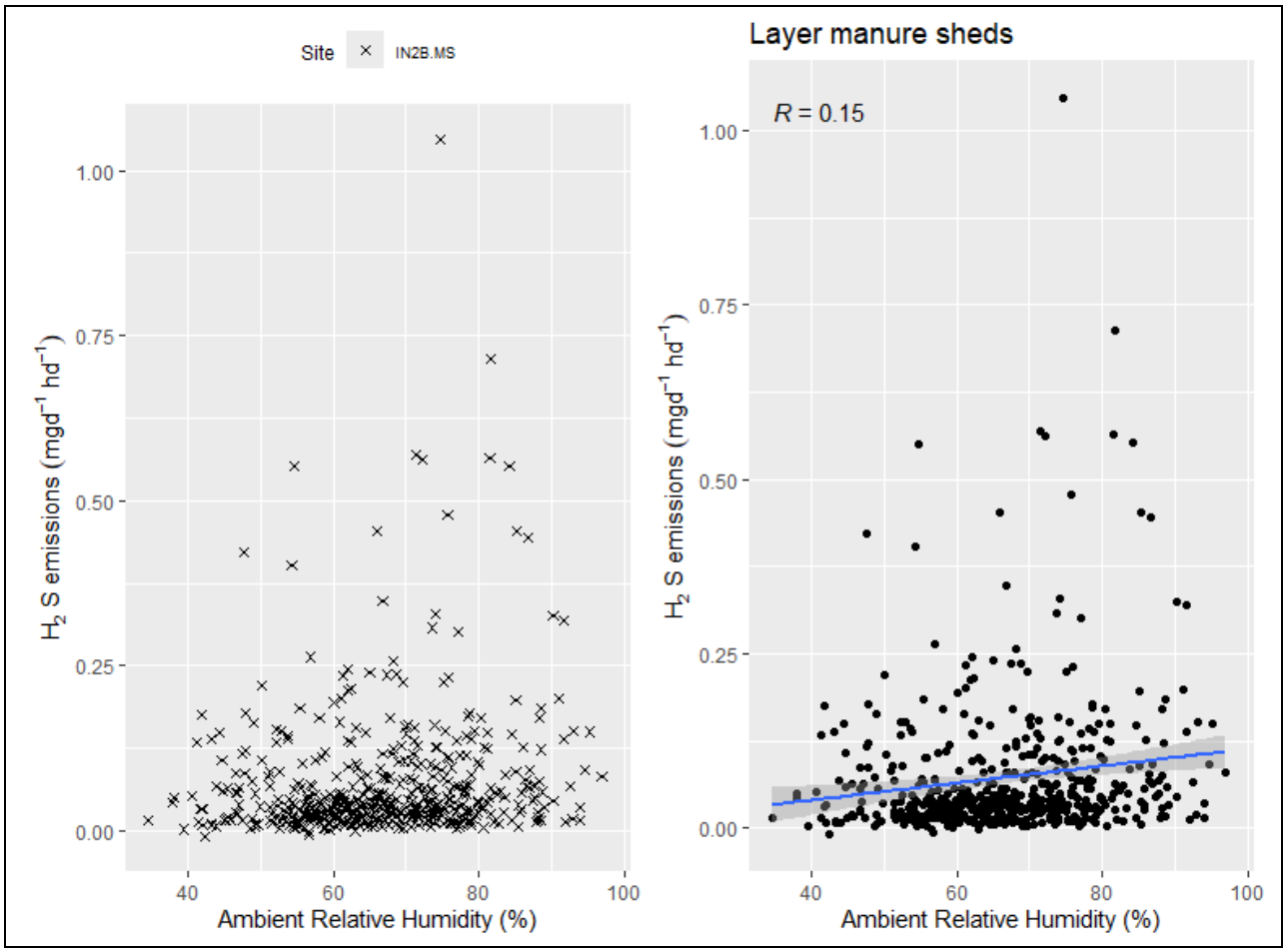

Figure 3.40: Scatter plot of layer manure sheds H_2S emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

3.2.2.3 Air pressure

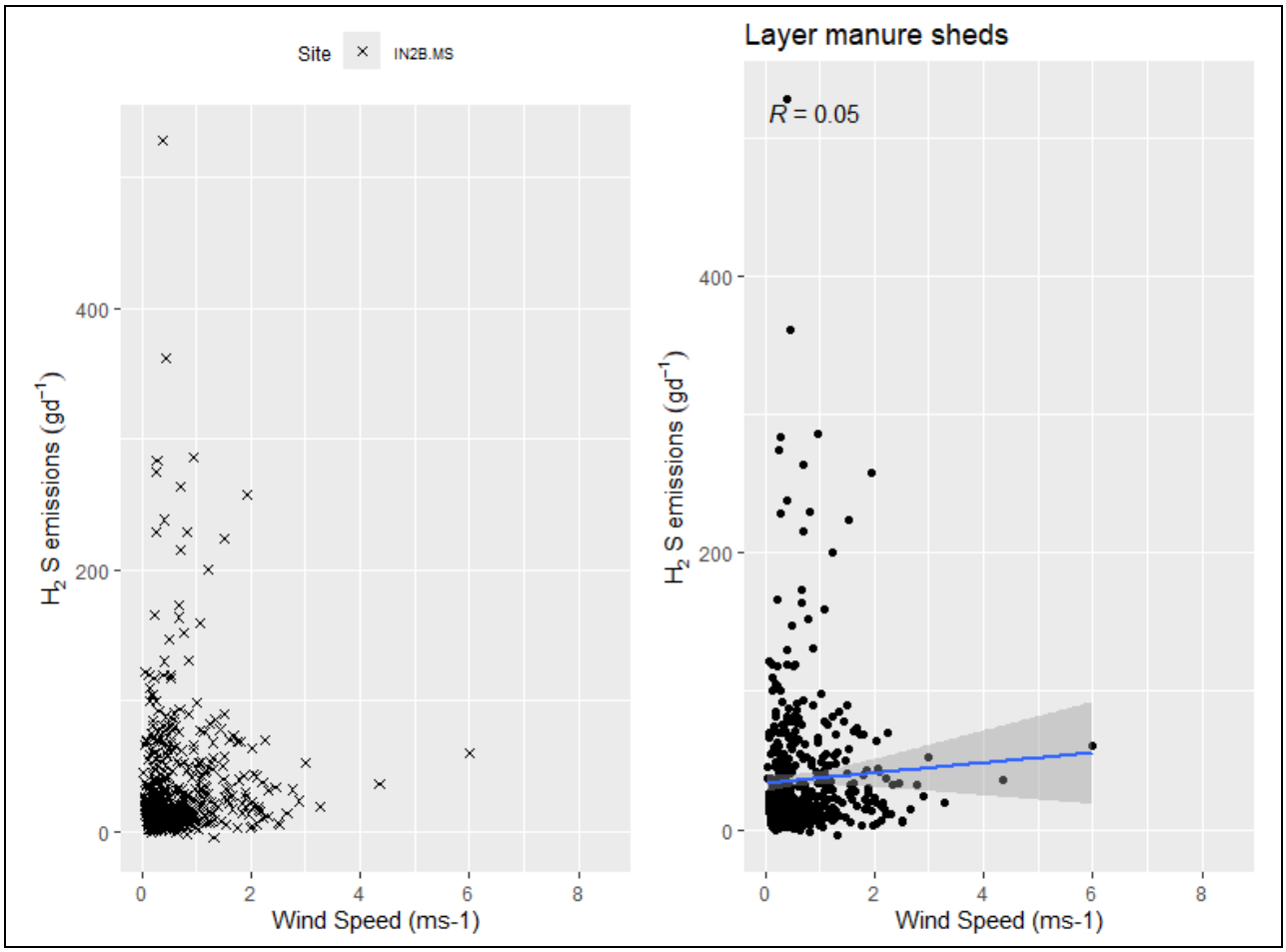

Figure 3.41: Scatter plot of layer manure sheds H_2S emissions (g d^{-1}) versus wind speed.

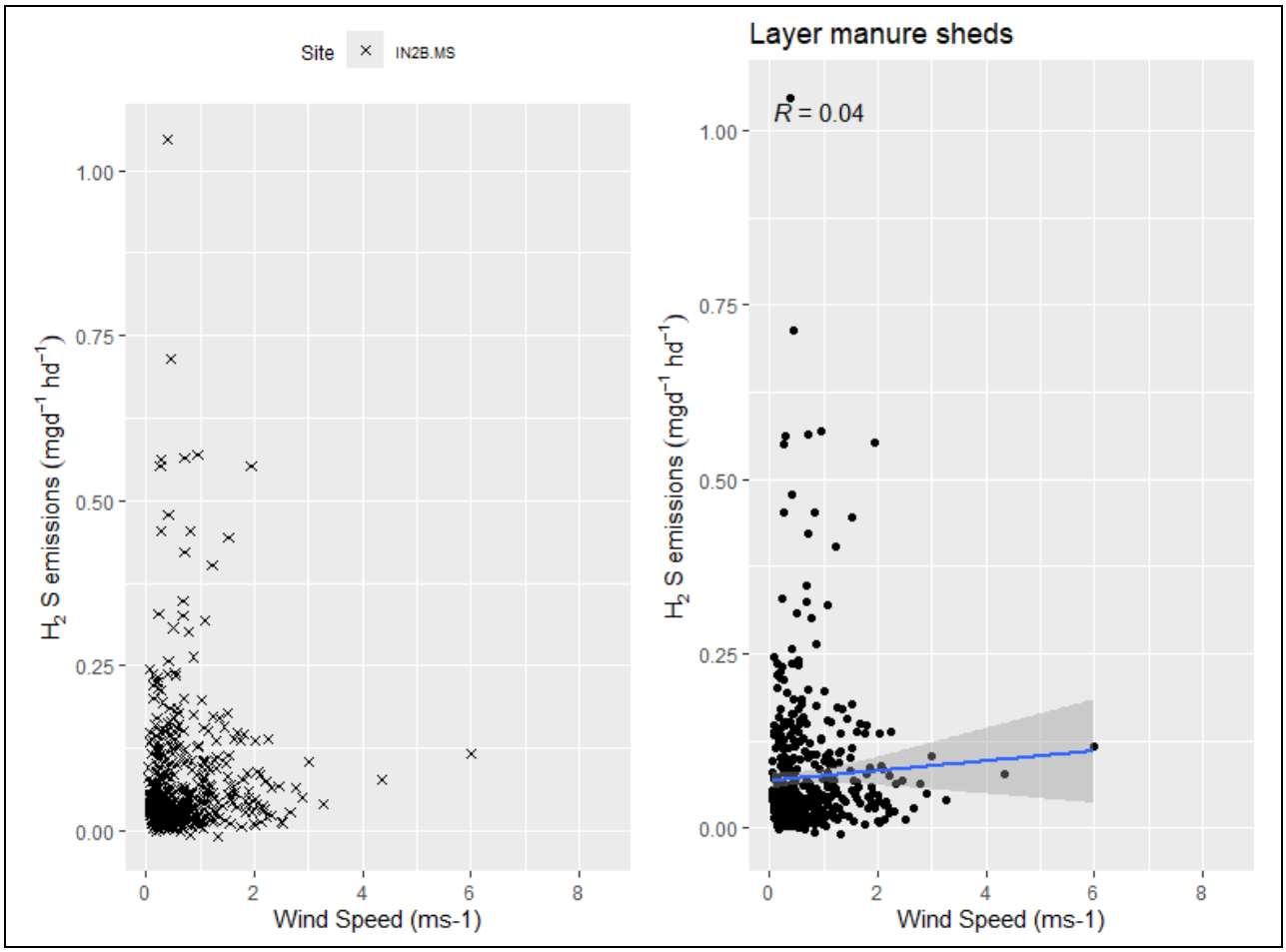

Figure 3.42: Scatter plot of layer manure sheds H_2S emissions (mg $d^{-1}hd^{-1}$) versus wind speed.

3.2.3 Particulate Matter (PM_{10})

3.2.3.1 Ambient temperature

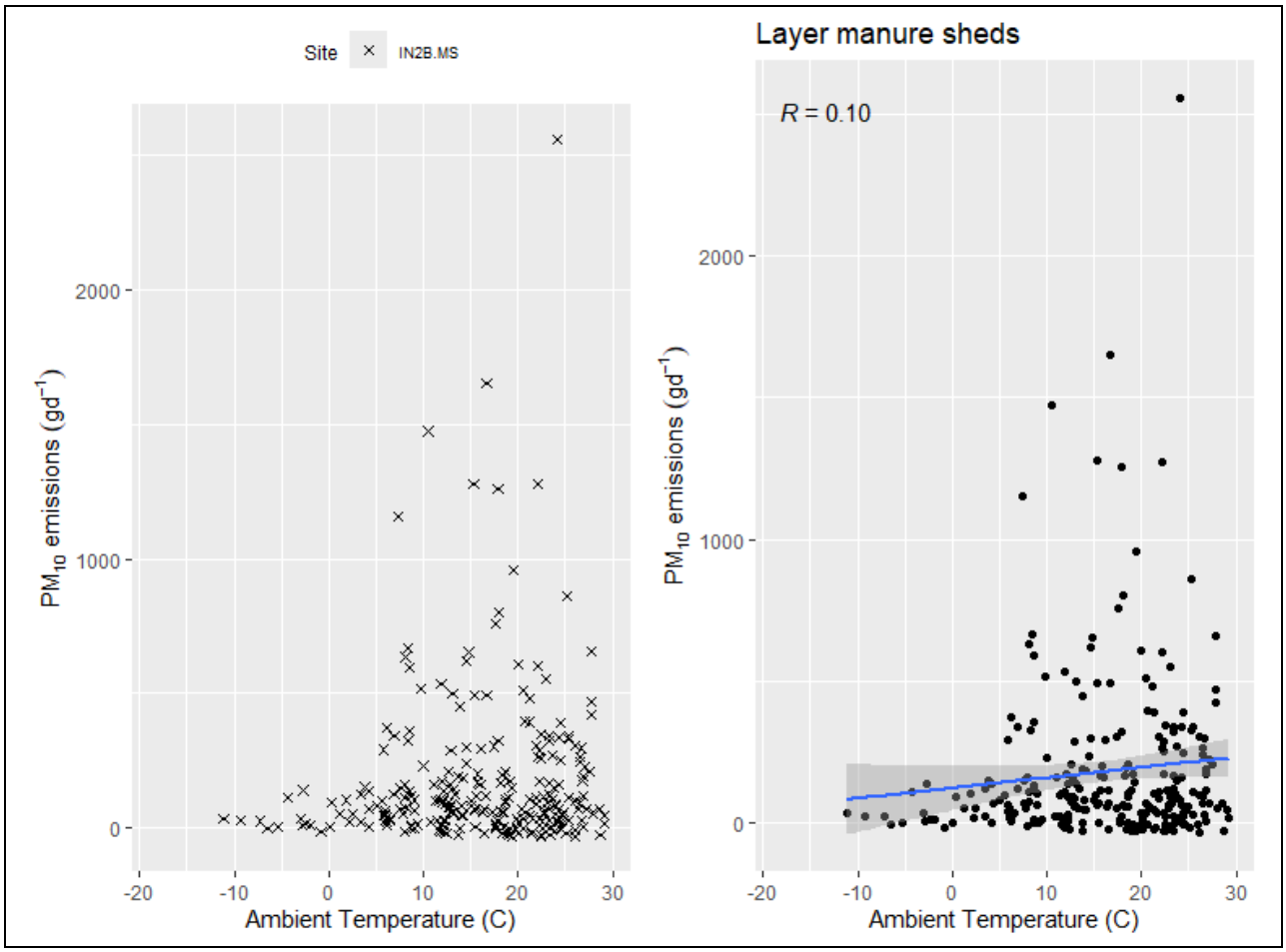

Figure 3.43: Scatter plot of layer manure sheds PM_{10} emissions (g d^{-1}) versus ambient temperature.

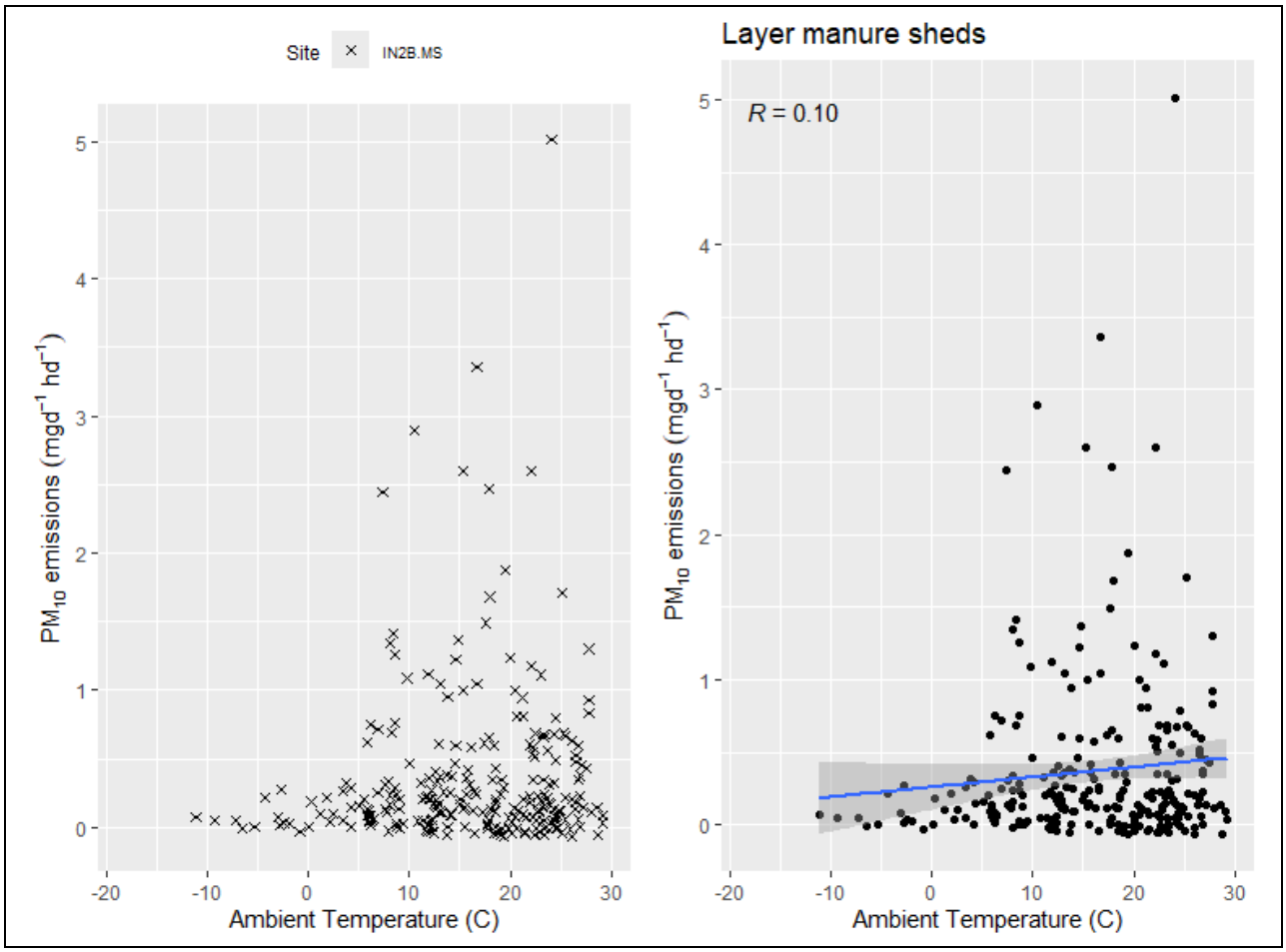

Figure 3.44: Scatter plot of layer manure sheds PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

3.2.3.2 *Ambient relative humidity*

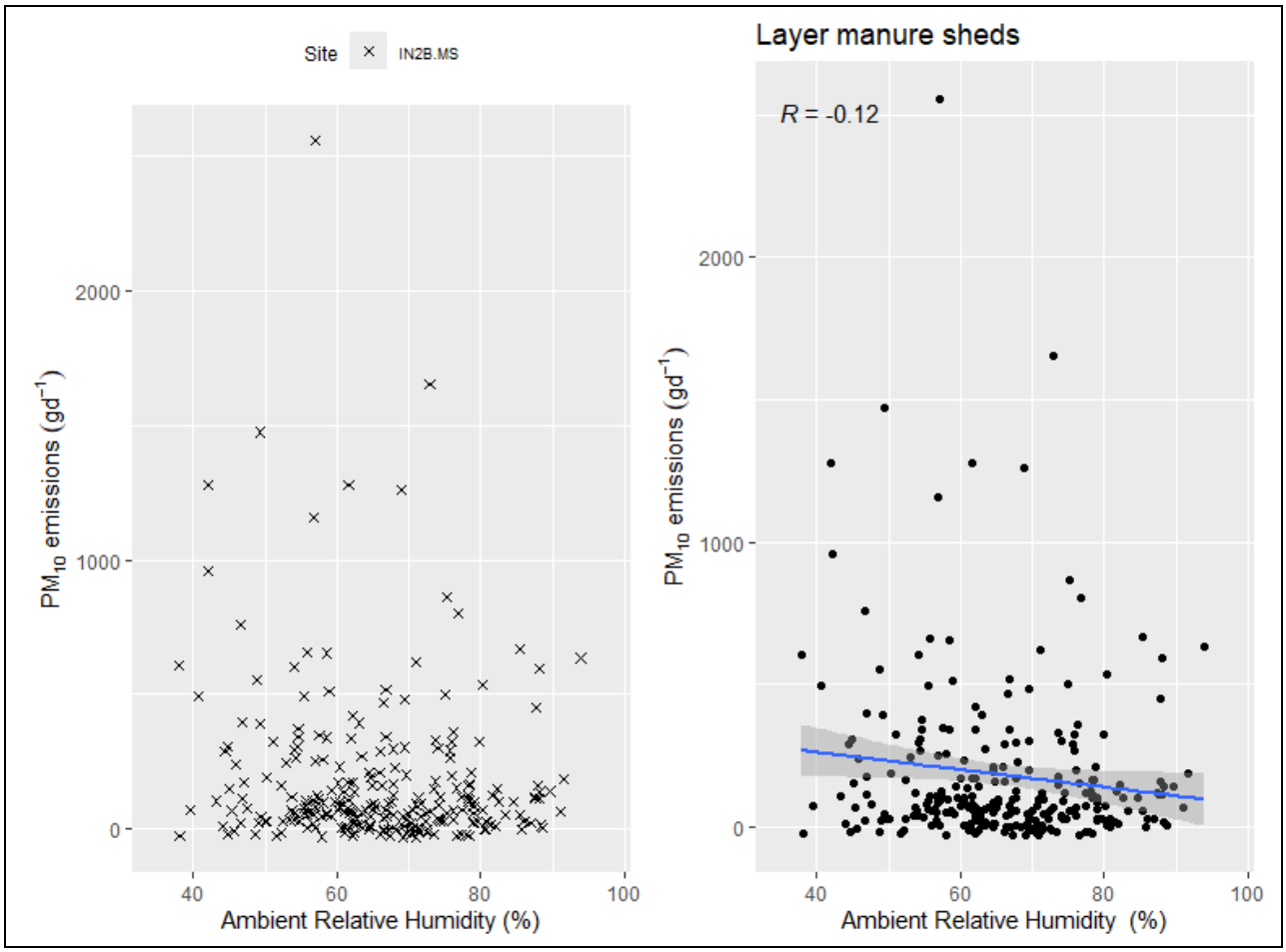

Figure 3.45: Scatter plot of layer manure sheds PM_{10} emissions (g d^{-1}) versus ambient relative humidity.

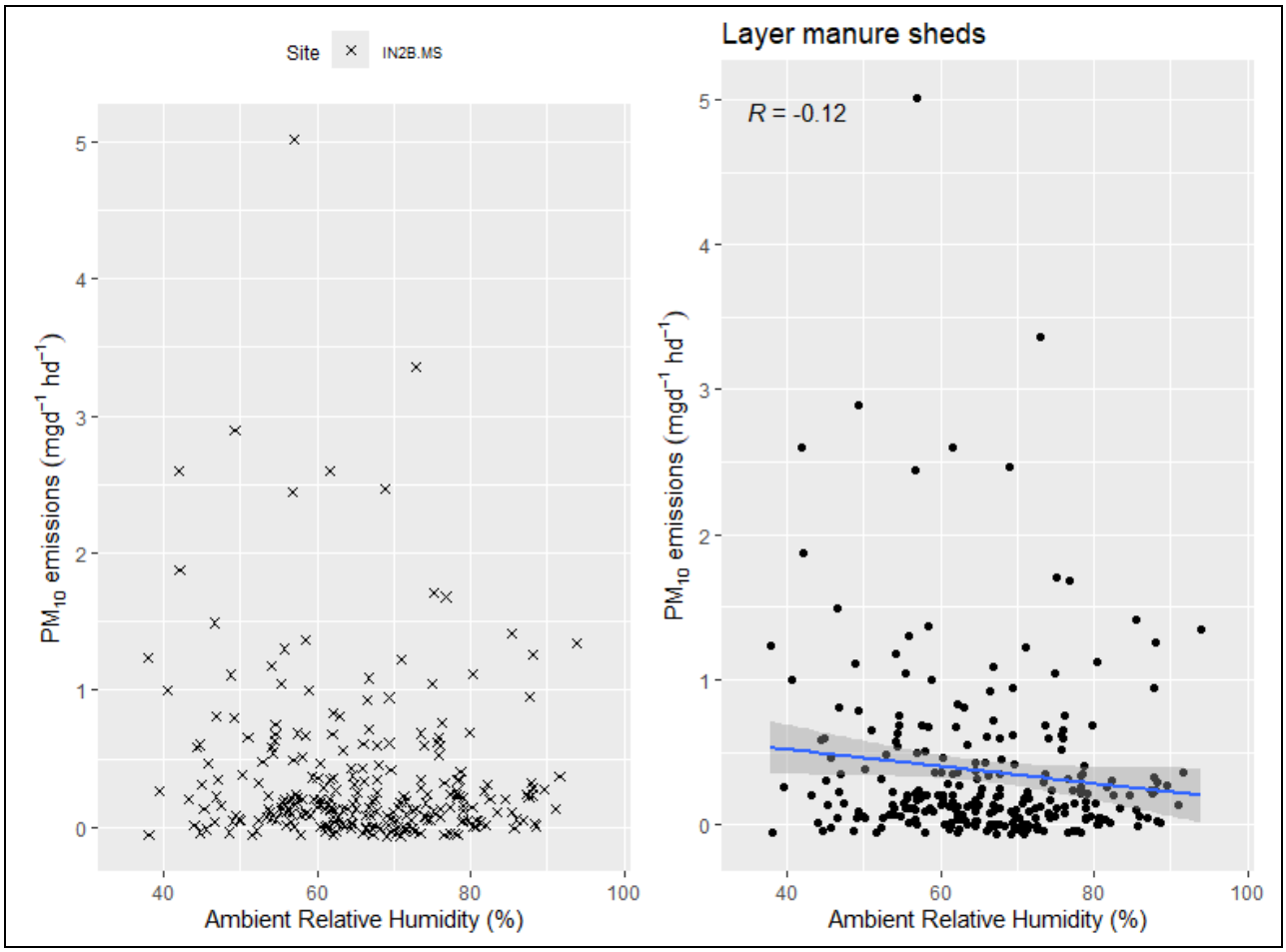

Figure 3.46: Scatter plot of layer manure sheds PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

3.2.3.3 Air pressure

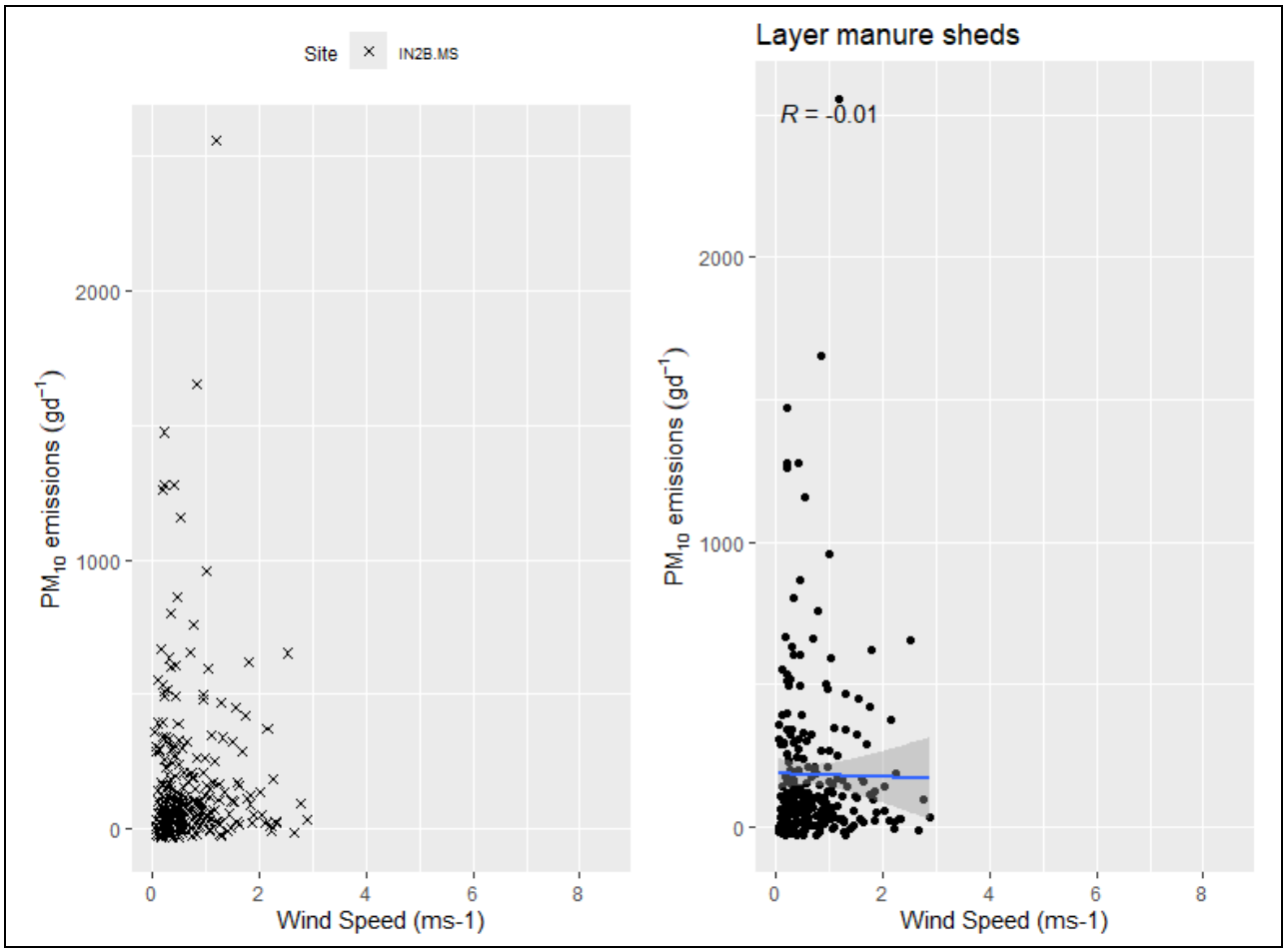

Figure 3.47: Scatter plot of layer manure sheds PM_{10} emissions (g d^{-1}) versus wind speed.

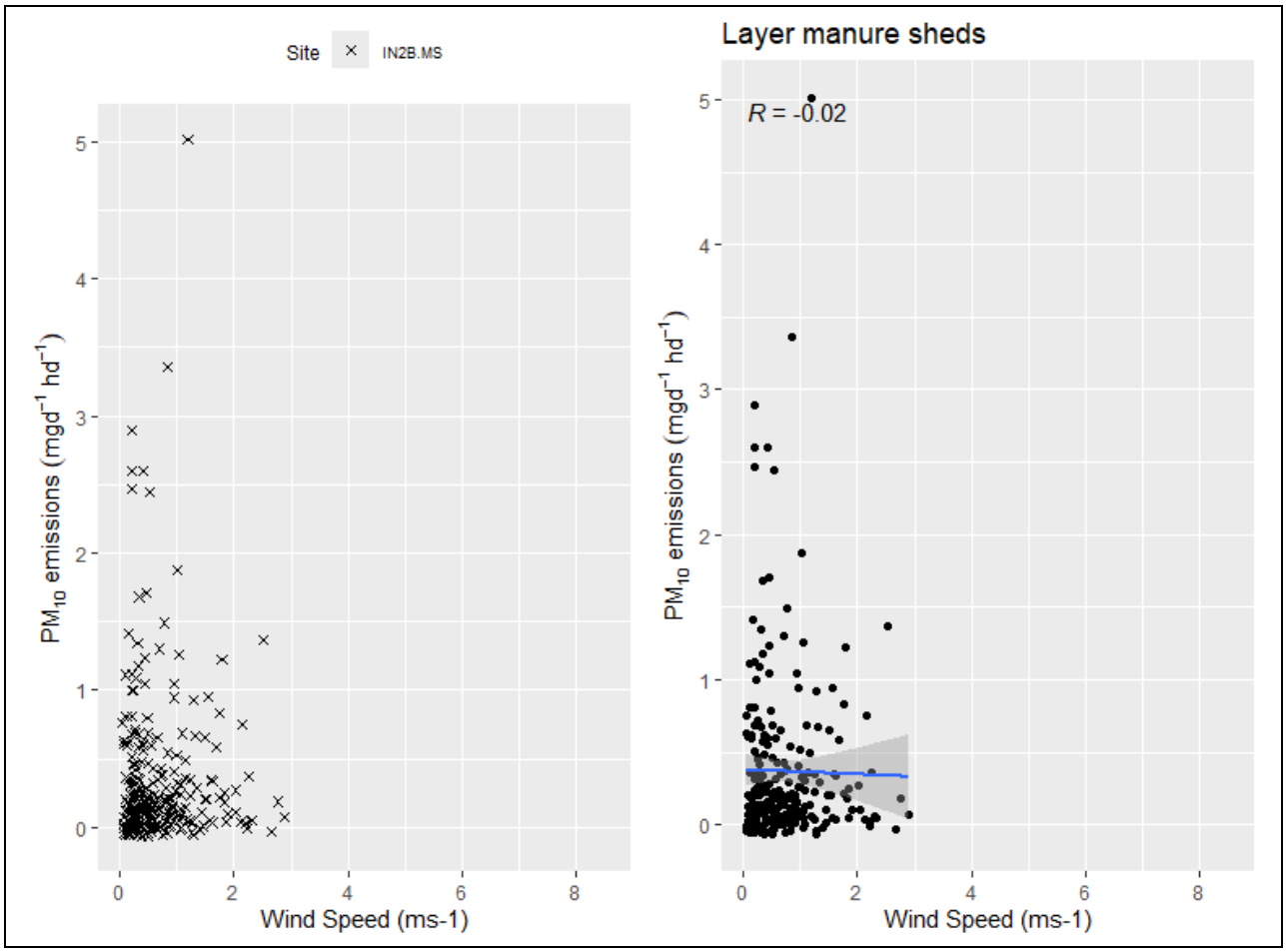

Figure 3.48: Scatter plot of layer manure sheds PM_{10} emissions (mg $d^{-1}hd^{-1}$) versus wind speed.

3.2.4 Particulate Matter ($PM_{2.5}$)

3.2.4.1 Ambient temperature

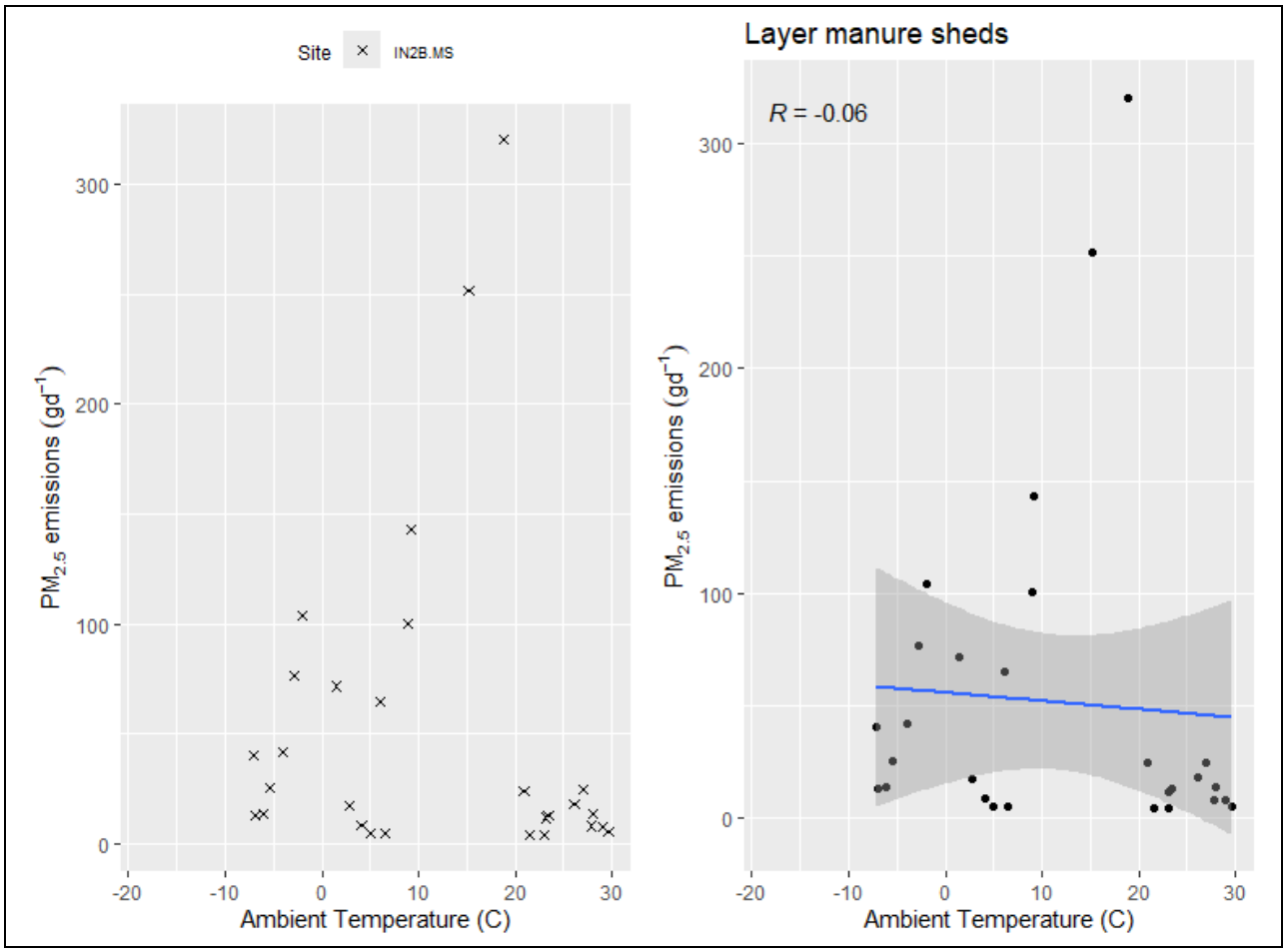

Figure 3.49: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (g d^{-1}) versus ambient temperature.

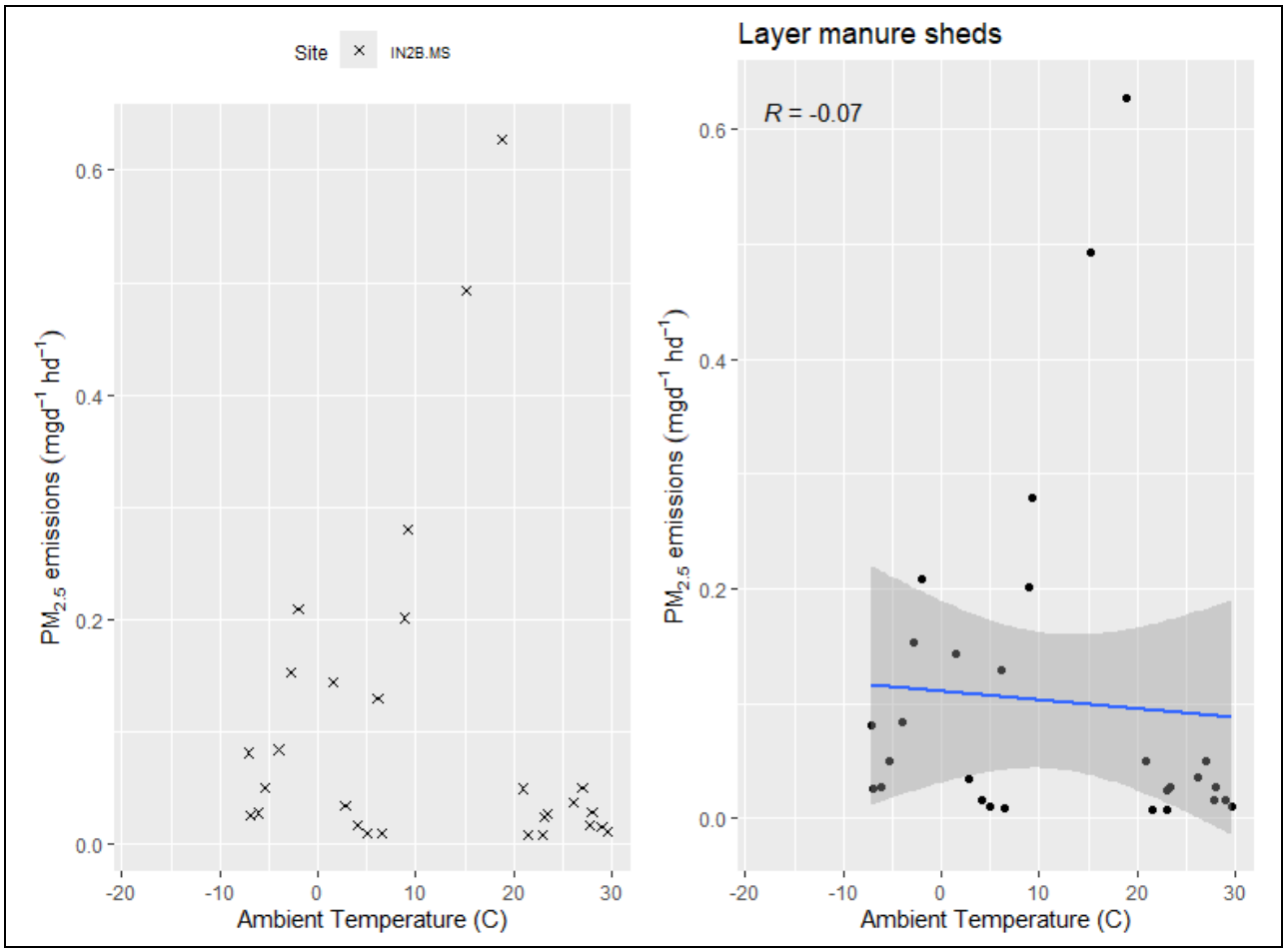

Figure 3.50: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

3.2.4.2 *Ambient relative humidity*

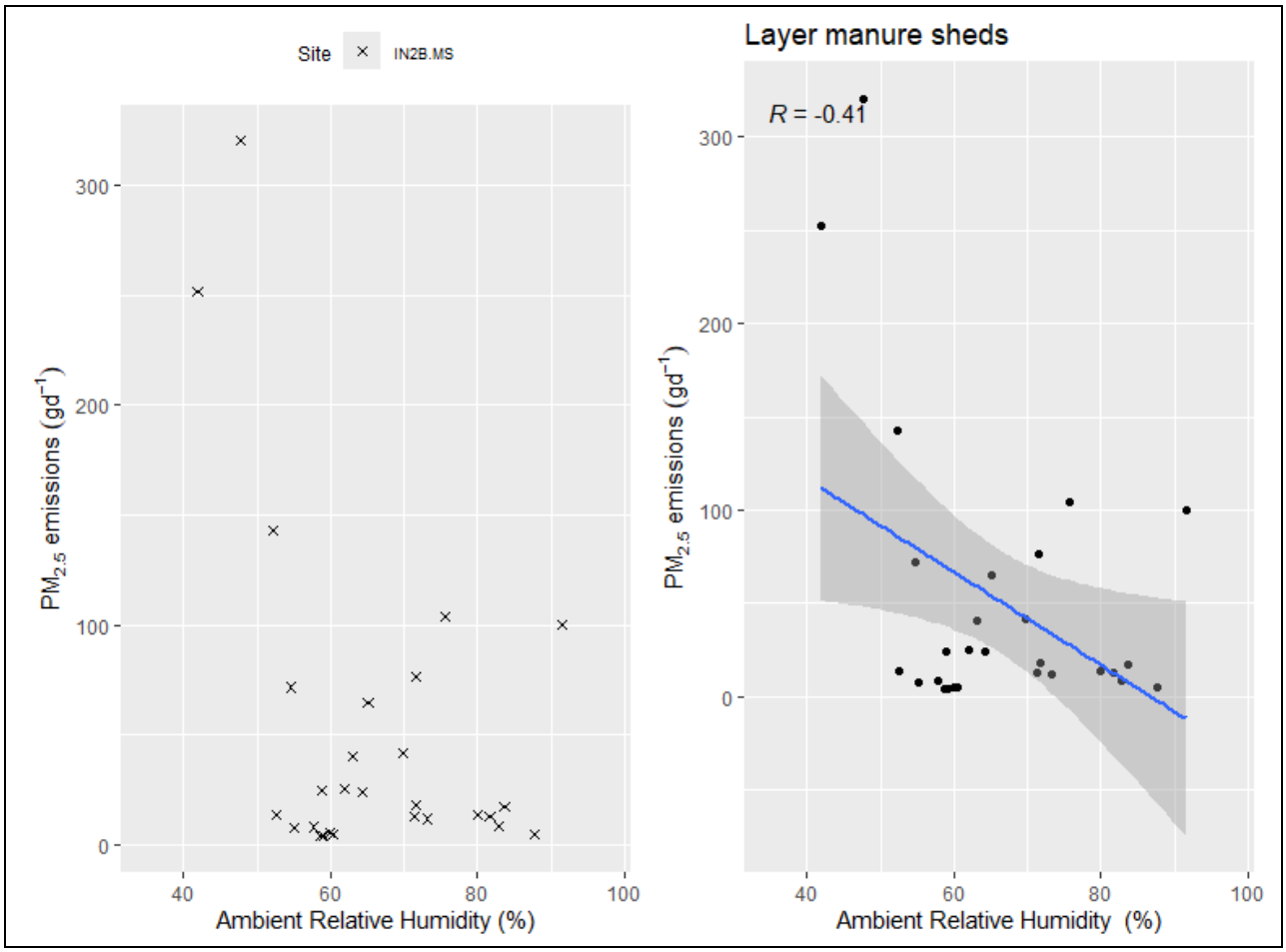

Figure 3.51: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (g d^{-1}) versus ambient relative humidity.

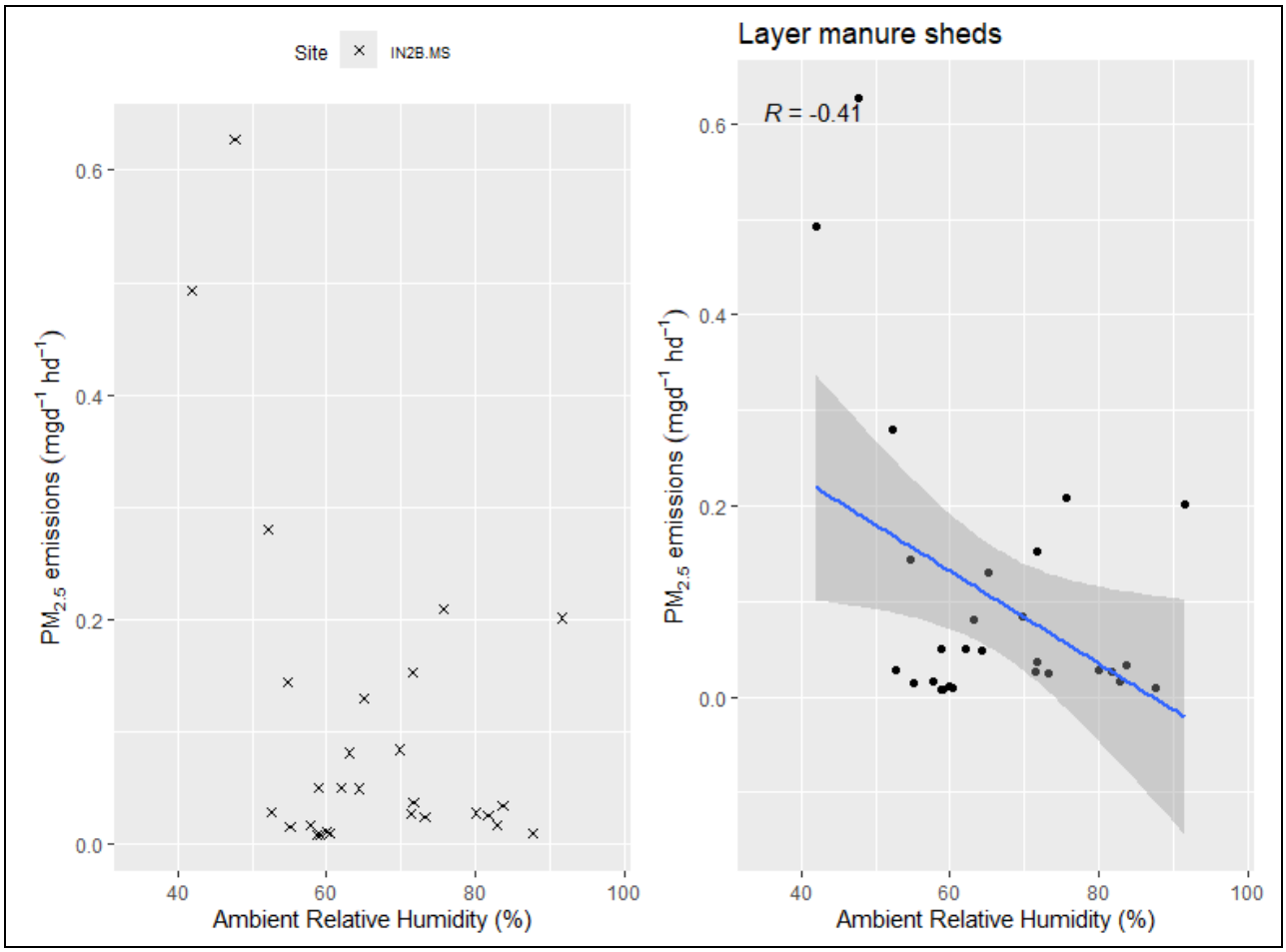

Figure 3.52: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

3.2.4.3 *Air pressure*

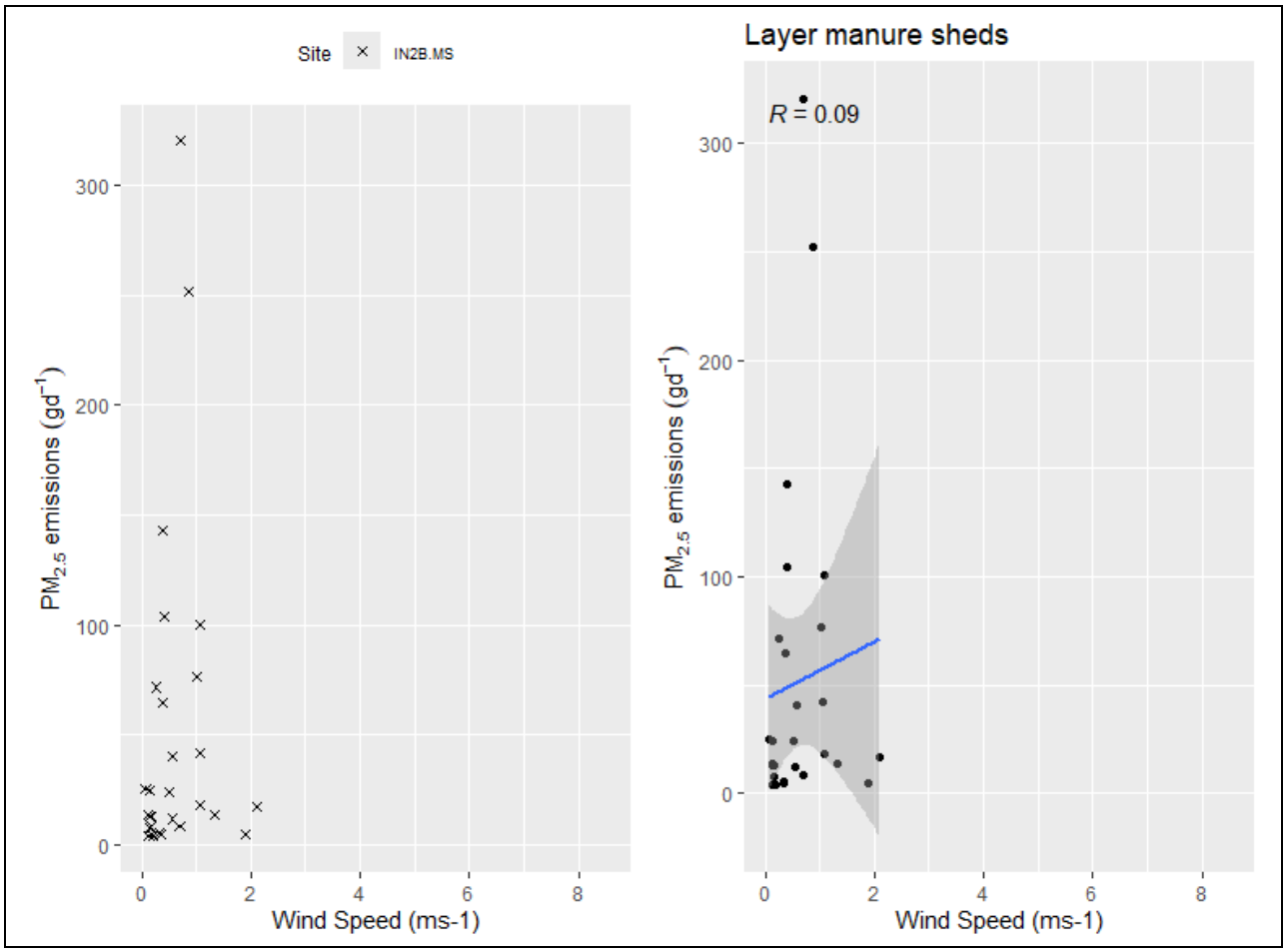

Figure 3.53: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (g d^{-1}) versus wind speed.

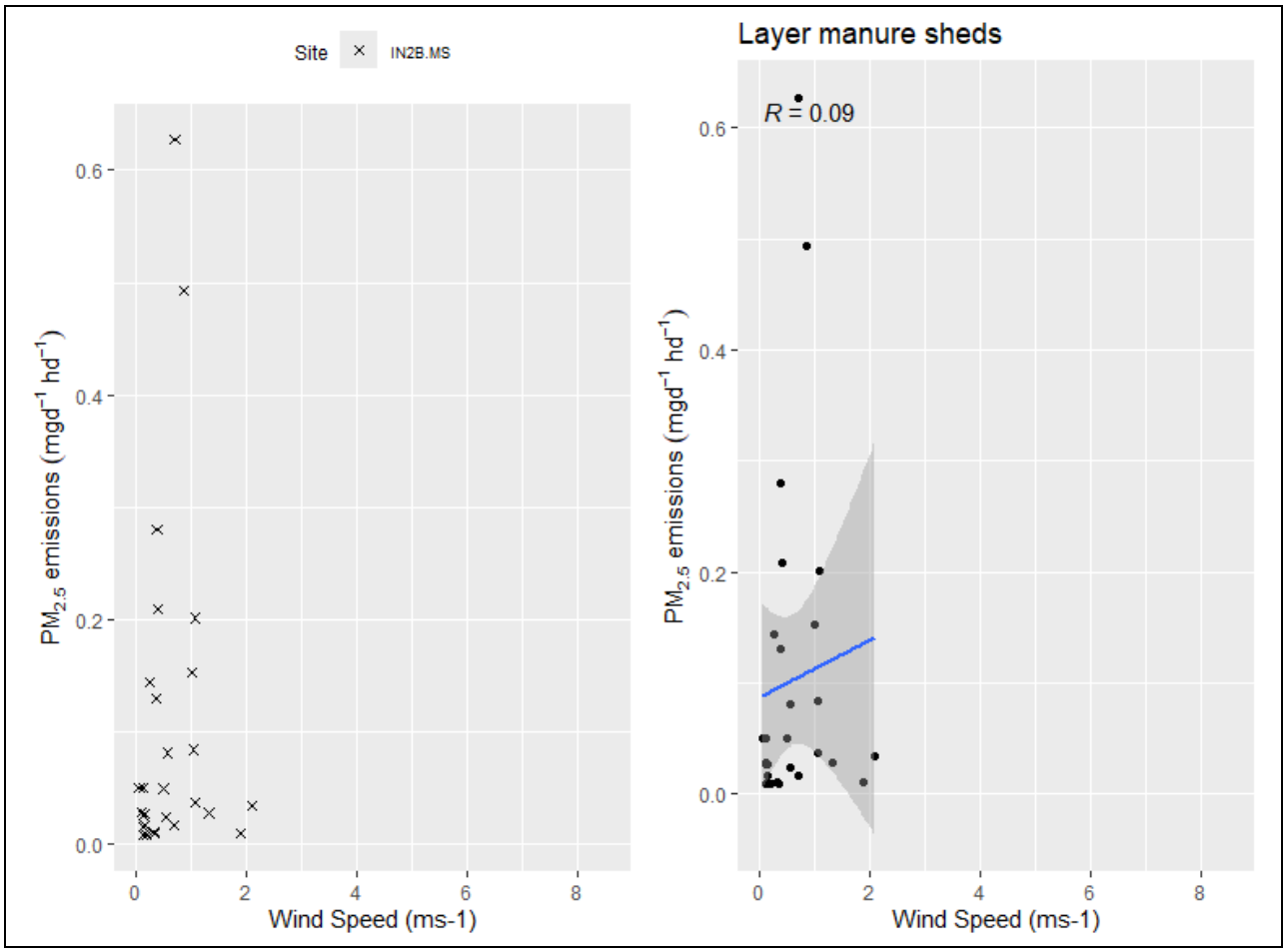

Figure 3.54: Scatter plot of layer manure sheds $PM_{2.5}$ emissions (mg $d^{-1}hd^{-1}$) versus wind speed.

3.2.5 Total Suspended Particulates (TSP

3.2.5.1 Ambient temperature

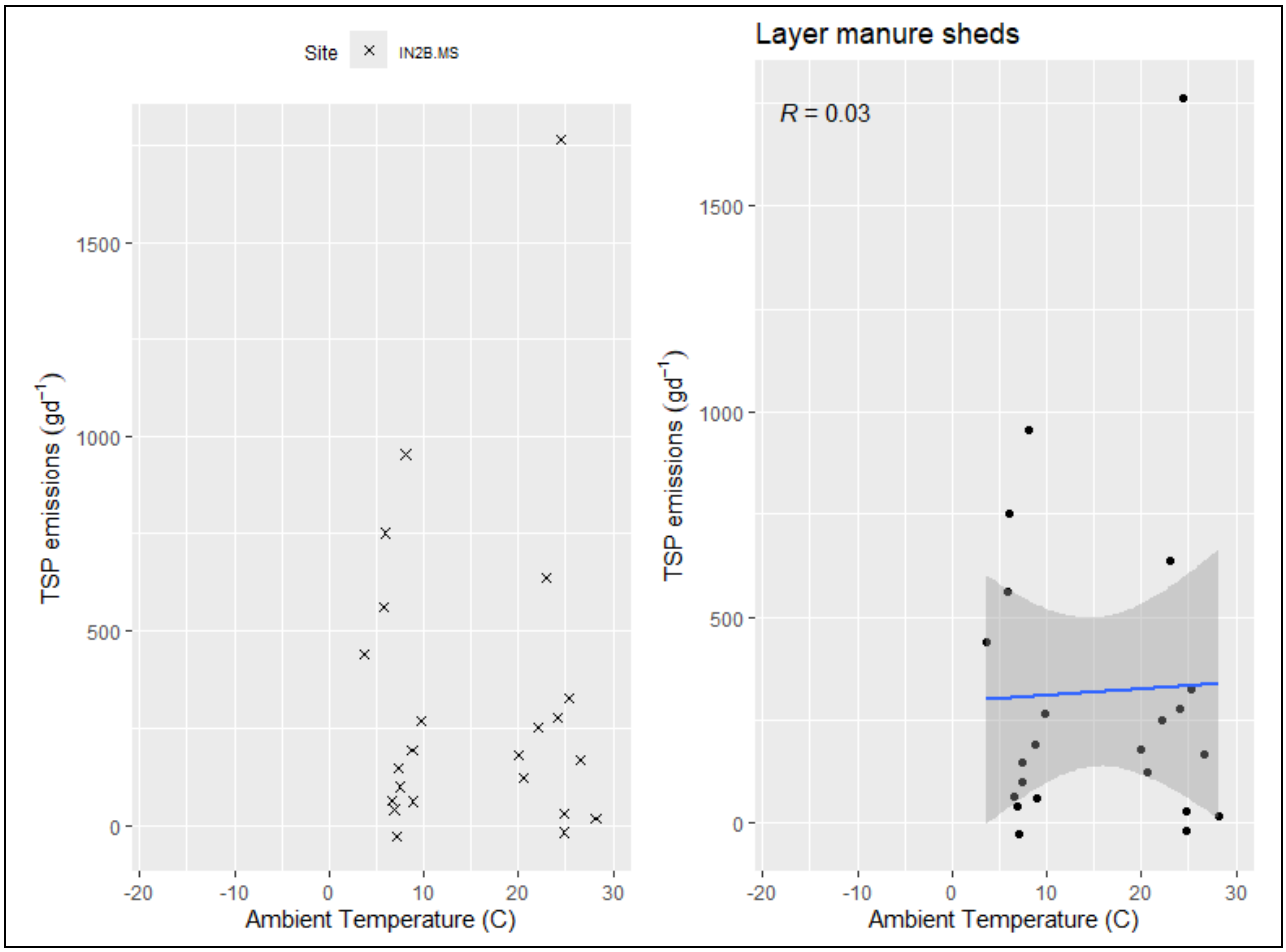

Figure 3.55: Scatter plot of layer manure sheds TSP emissions (g d^{-1}) versus ambient temperature.

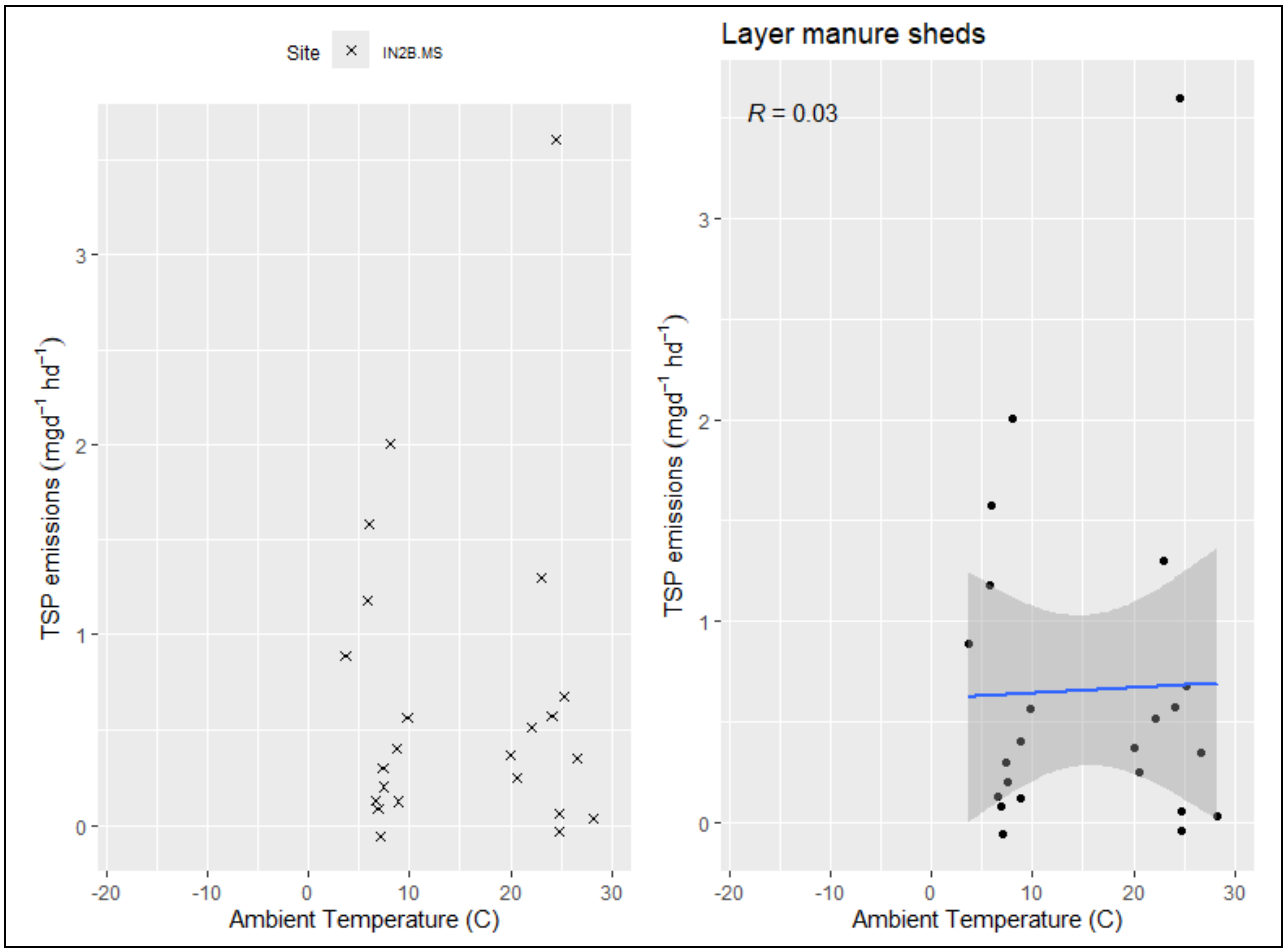

Figure 3.56: Scatter plot of layer manure sheds TSP emissions (mg $d^{-1}hd^{-1}$) versus ambient temperature.

3.2.5.2 Ambient relative humidity

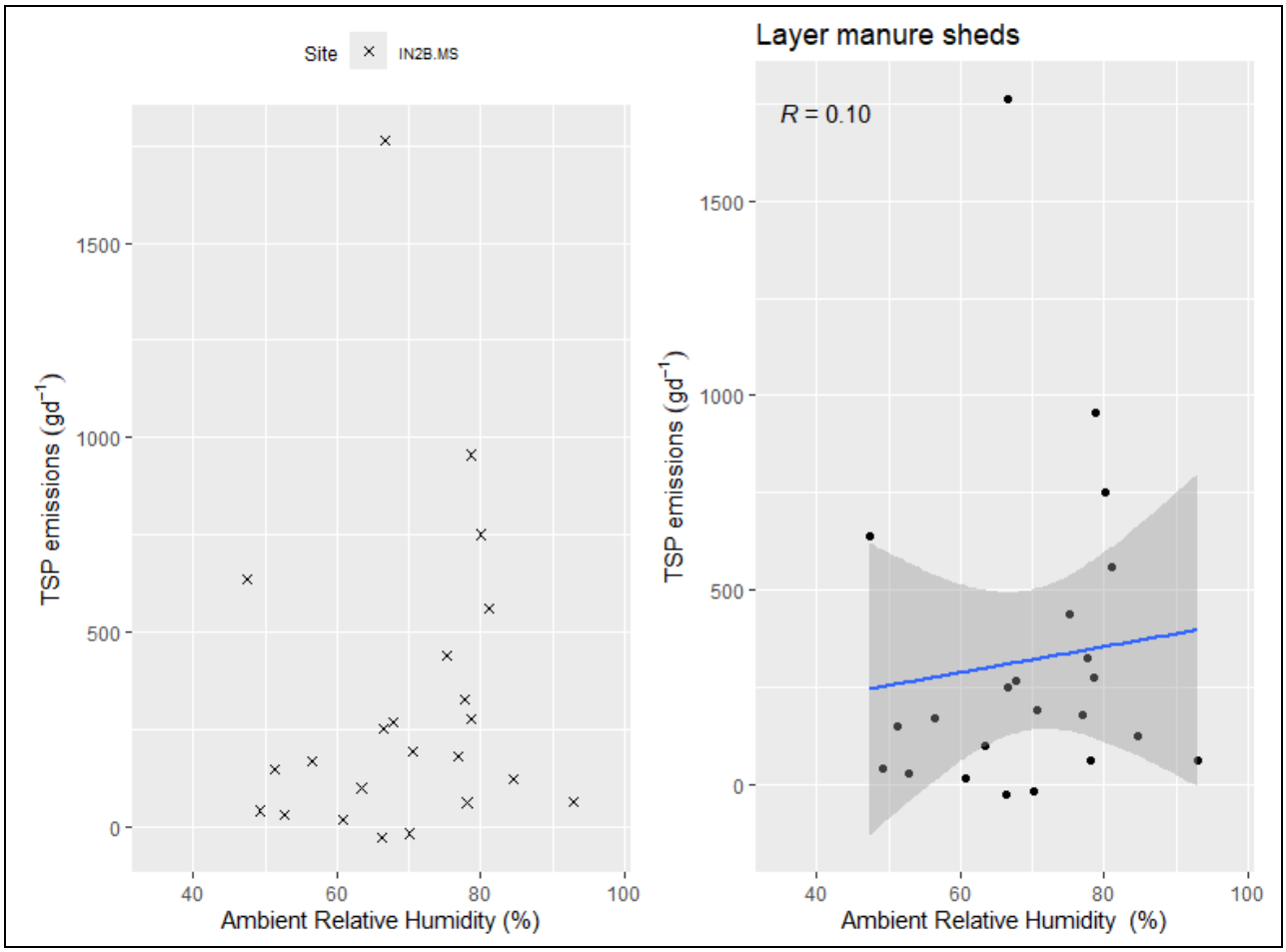

Figure 3.57: Scatter plot of layer manure sheds TSP emissions (g d^{-1}) versus ambient relative humidity.

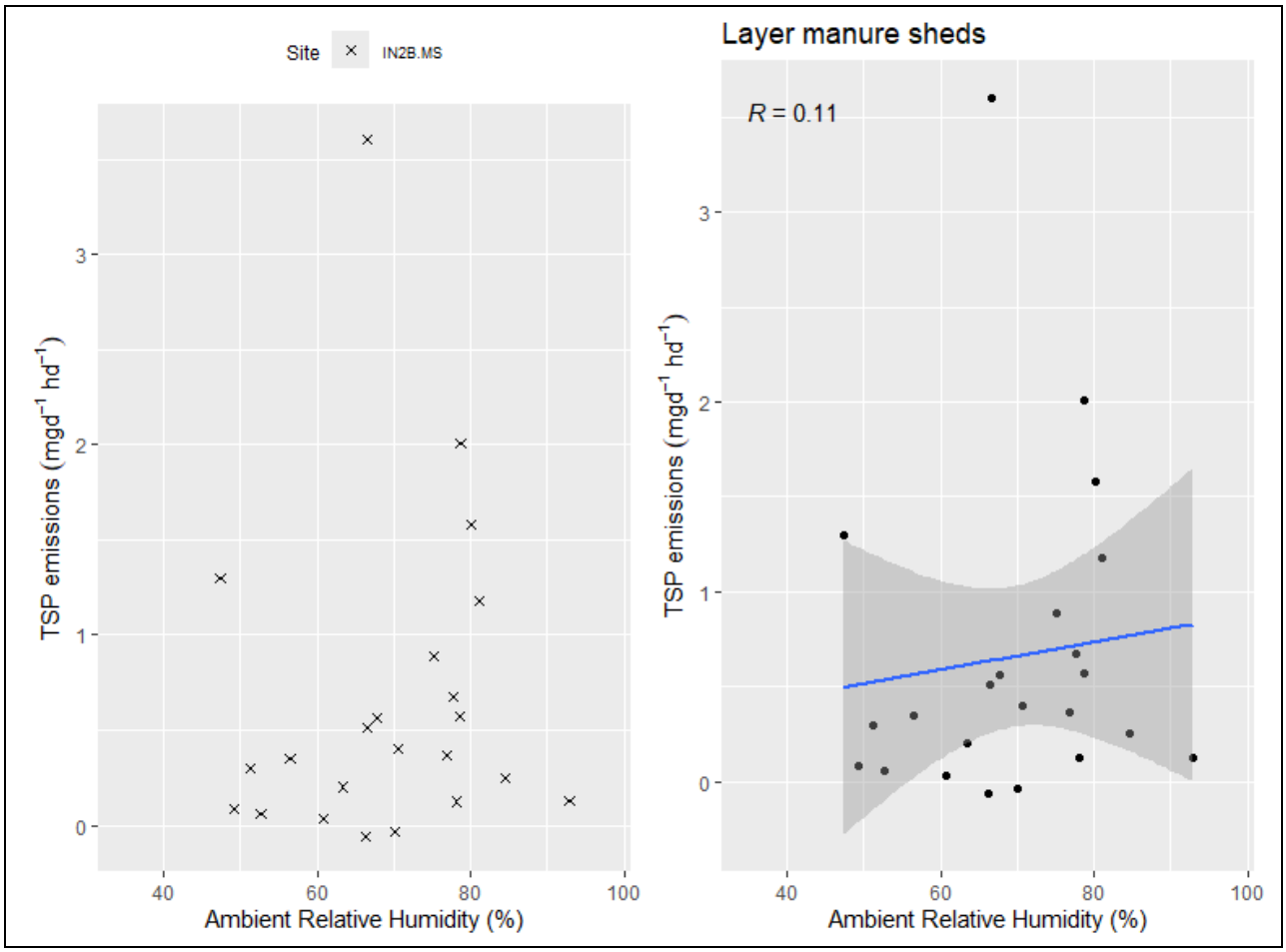

Figure 3.58: Scatter plot of layer manure sheds TSP emissions (mg $d^{-1}hd^{-1}$) versus ambient relative humidity.

3.2.5.3 Air pressure

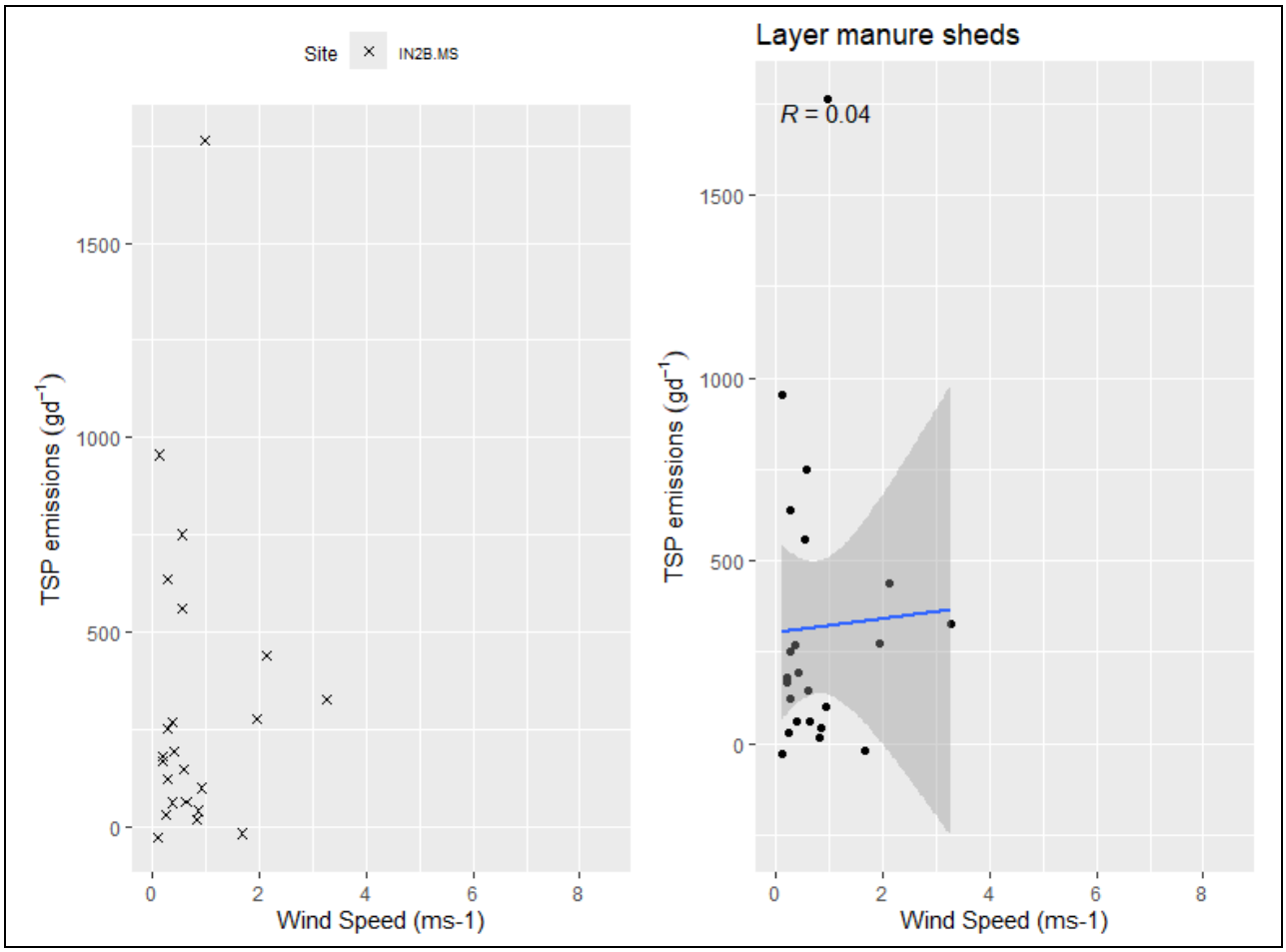

Figure 3.59: Scatter plot of layer manure sheds TSP emissions (g d^{-1}) versus wind speed.

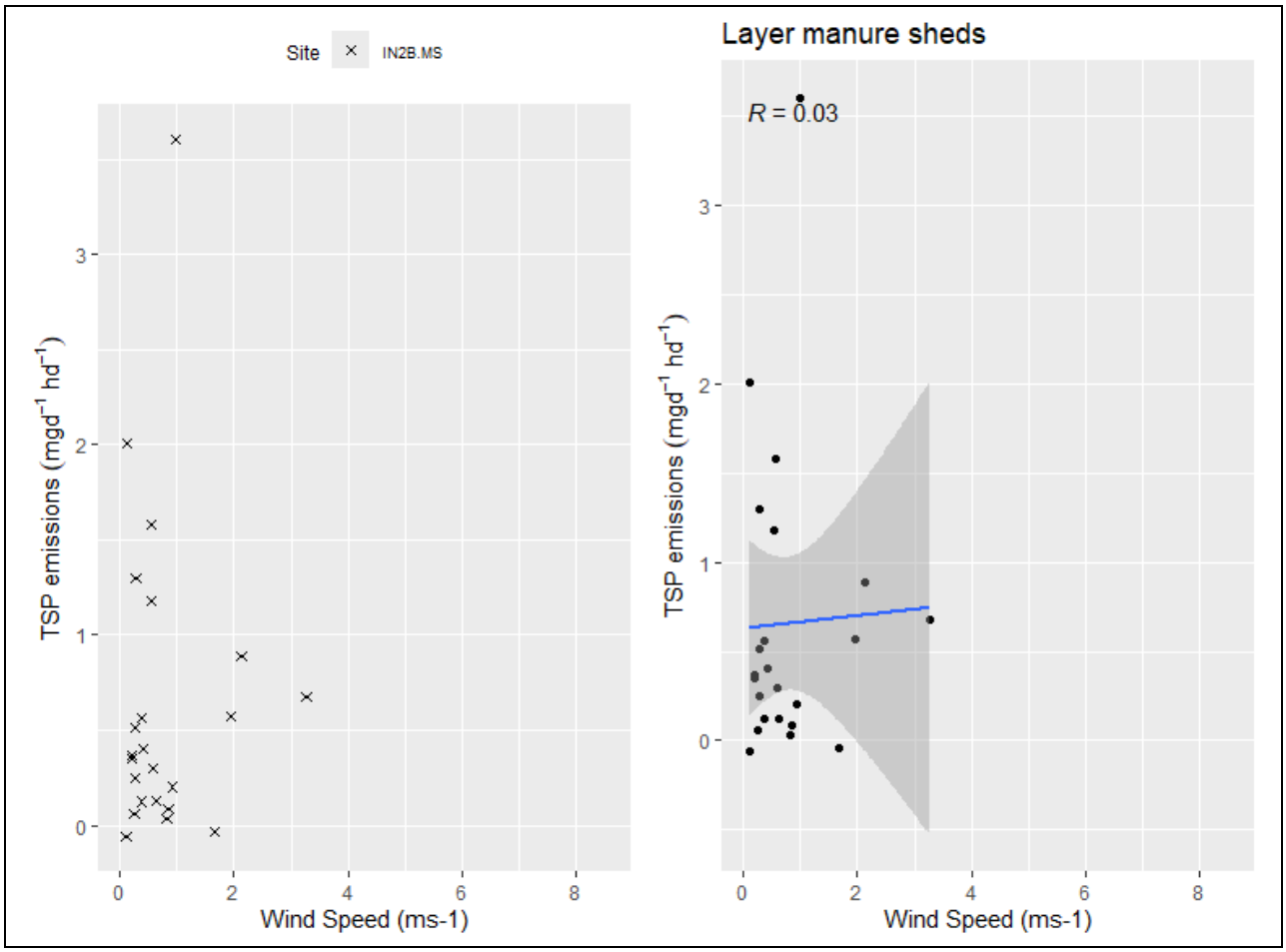

Figure 3.60: Scatter plot of layer manure sheds TSP emissions (mg $d^{-1}hd^{-1}$) versus air pressure.

Appendix G – Daily Models

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Table G-1. Parameter combinations tested as models for NH_3 and H_2S emissions.

Model	Parameter
G-1	Intercept, Live animal weight, Ambient temperature
G-2	Intercept, Live animal weight, Exhaust temperature
G-3	Intercept, Inventory, Ambient temperature
G-4	Intercept, Inventory, Exhaust temperature
G-5	Intercept, Inventory, Hen age, Ambient temperature
G-6	Intercept, Inventory, Ambient temperature, Management phase (manure cleanouts (C), flock emptying and replacement (E), full flock (F), molting (M), and transition (T))
G-7	Intercept, Inventory, Manure age, Ambient temperature
G-8	Intercept, Inventory, Ambient temperature, Ambient relative humidity
G-9	Intercept, Inventory, Ambient temperature, Exhaust relative humidity
G-10	Intercept, Inventory, Ambient temperature, Ambient relative humidity, Management phase (C,E,F,M,T)

Table G-2. Parameter combinations tested as models for PM_{10}, $PM_{2.5}$, and TSP emissions.

Model	Parameter
P-1	Intercept, Inventory
P-2	Intercept, Inventory, Ambient relative humidity
P-3	Intercept, Inventory, Exhaust relative humidity
P-4	Intercept, Inventory, Ambient relative humidity, Ambient temperature
P-5	Intercept, Inventory, Ambient temperature, Exhaust relative humidity
P-6	Intercept, Inventory, Ambient relative humidity, Exhaust temperature
P-7	Intercept, Inventory, Exhaust temperature, Exhaust relative humidity
P-8	Intercept, Live animal weight, Ambient temperature, Ambient relative humidity
P-9	Intercept, Live animal weight, Ambient temperature, Exhaust relative humidity
P-10	Intercept, Live animal weight, Ambient relative humidity, Exhaust temperature
P-11	Intercept, Live animal weight, Exhaust temperature, Exhaust relative humidity
P-12	Intercept, Hen age, Inventory, Ambient relative humidity
P-13	Intercept, Inventory, Ambient relative humidity, Management phase (C,E,F,M,T)
P-14	Intercept, Inventory, Ambient temperature, Ambient relative humidity, Management phase (C,E,F,M,T)
P-15	Intercept, Inventory, Manure age, Ambient relative humidity

Table G-3. Parameter and estimates for high rise layer NH_3 emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
G-1	Intercept	2.7356	0.1963	<.0001
	Live animal weight	0.0043	0.0008	<.0001
	Ambient temperature	0.0385	0.0010	<.0001
G-2	Intercept	1.0666	0.2248	<.0001
	Live animal weight	0.0025	0.0010	*0.0131*
	Exhaust temperature	0.1034	0.0023	<.0001
G-3	Intercept	2.7852	0.2047	<.0001
	Inventory	0.0059	0.0012	<.0001
	Ambient temperature	0.0385	0.0010	<.0001
G-4	Intercept	1.1075	0.2308	<.0001
	Inventory	0.0034	0.0015	*0.0259*
	Exhaust temperature	0.1032	0.0023	<.0001
G-5	Intercept	2.8780	0.1420	<.0001
	Inventory	0.0038	0.0008	<.0001
	Hen age	0.0002	0.0003	**0.6459**
	Ambient temperature	0.0411	0.0012	<.0001
G-6	Intercept	2.8863	0.2312	<.0001
	Inventory	0.0049	0.0016	0.0017
	Ambient temperature	0.0384	0.0010	<.0001
	C	0.0118	0.0804	**0.8836**
	E	-0.2943	0.1268	*0.0204*
	F	-0.0035	0.0759	**0.9632**
	M	-0.0610	0.0949	**0.5204**
	T	0.0000	.	.
G-7	Intercept	2.3118	0.1459	<.0001
	Inventory	0.0097	0.0009	<.0001
	Manure age	0.0006	0.0002	*0.0134*
	Ambient temperature	0.0408	0.0011	<.0001
G-8	Intercept	2.6598	0.2257	<.0001
	Inventory	0.0059	0.0013	<.0001
	Ambient temperature	0.0387	0.0010	<.0001
	Ambient relative humidity	0.0018	0.0003	<.0001
G-9	Intercept	2.2104	0.2775	<.0001
	Inventory	0.0060	0.0014	<.0001
	Ambient temperature	0.0388	0.0010	<.0001
	Exhaust relative humidity	0.0082	0.0007	<.0001
G-10	Intercept	2.7728	0.2504	<.0001
	Inventory	0.0049	0.0016	0.0029
	Ambient temperature	0.0386	0.0010	<.0001
	Ambient relative humidity	0.0018	0.0003	<.0001
	C	0.0037	0.0795	**0.9626**
	E	-0.3120	0.1282	*0.0151*
	F	-0.0149	0.0755	**0.8435**
	M	-0.0665	0.0985	**0.4996**
	T	0.0000	.	.

Table G-4. Fit and evaluation statistics for the high rise house NH_3 models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (kg day^{-1})	MB[b] (kg day^{-1})	NMB[b] (%)
G-1	-1638	-1608	-1608	-1611	0.543	16.834	59.626	62.555	0.351	0.334
G-2	-2058	-2028	-2028	-2031	0.425	18.743	68.8	72.179	2.42	2.307
G-3	-1635	-1605	-1605	-1608	0.52	17.118	61.181	64.182	1.093	1.042
G-4	-2052	-2022	-2022	-2026	0.402	18.946	69.969	73.401	3.189	3.04
G-5	-1219	-1199	-1199	-1201	0.263	18.838	74.74	71.793	6.855	7.136
G-6	-1644	-1606	-1606	-1610	0.453	17.909	64.732	67.907	2.299	2.192
G-7	-1199	-1187	-1187	-1188	0.686	15.104	59.245	62.519	8.739	8.281
G-8	-1627	-1595	-1595	-1598	0.541	16.851	59.12	60.818	0.165	0.161
G-9	-1778	-1746	-1746	-1749	0.51	17.628	63.48	66.595	1.368	1.304
G-10	-1637	-1597	-1596	-1601	0.474	17.68	62.777	64.581	1.382	1.344

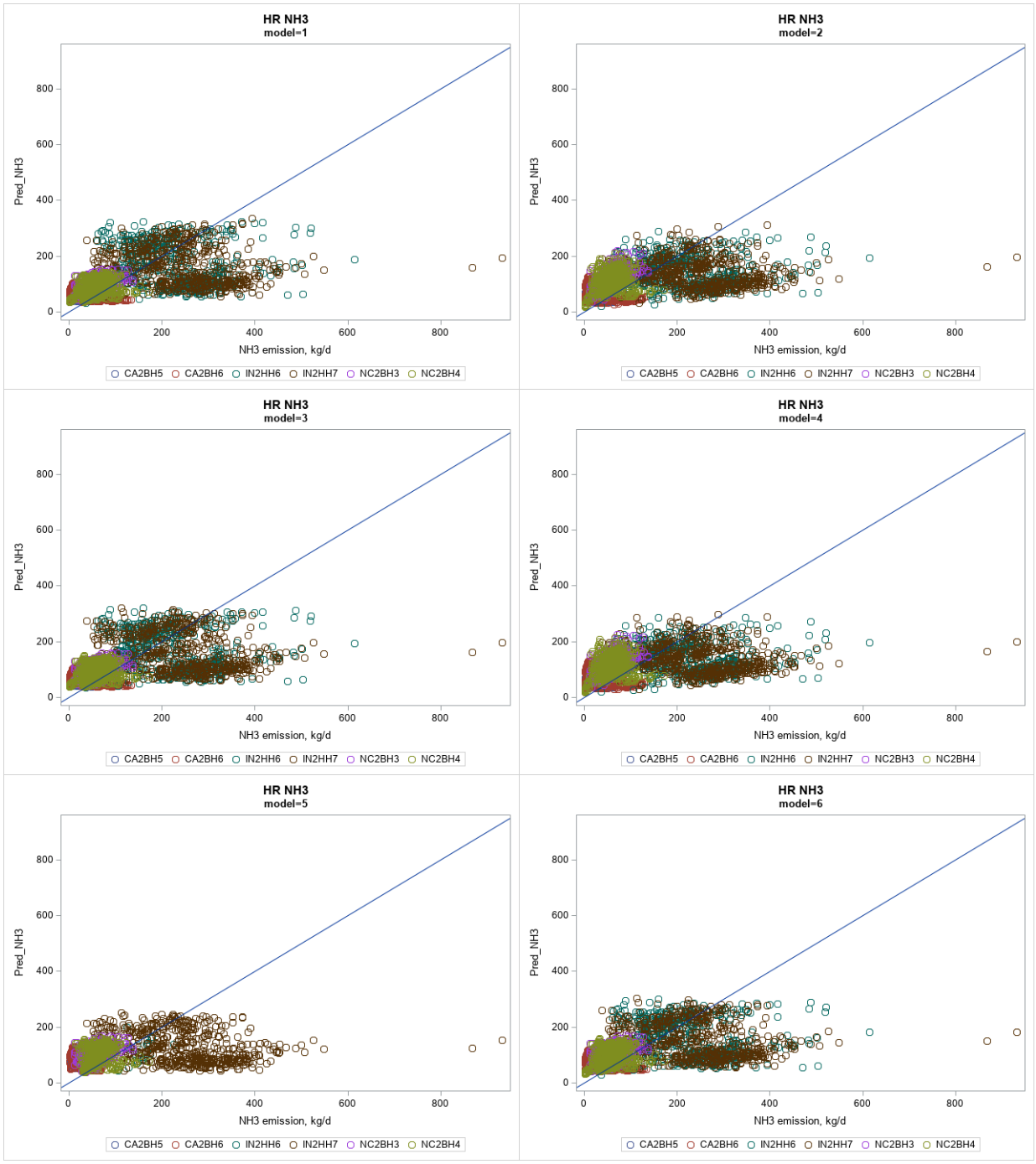

Figure G-1. High rise layer house NH_3 one-to-one plots models 1 through 6.

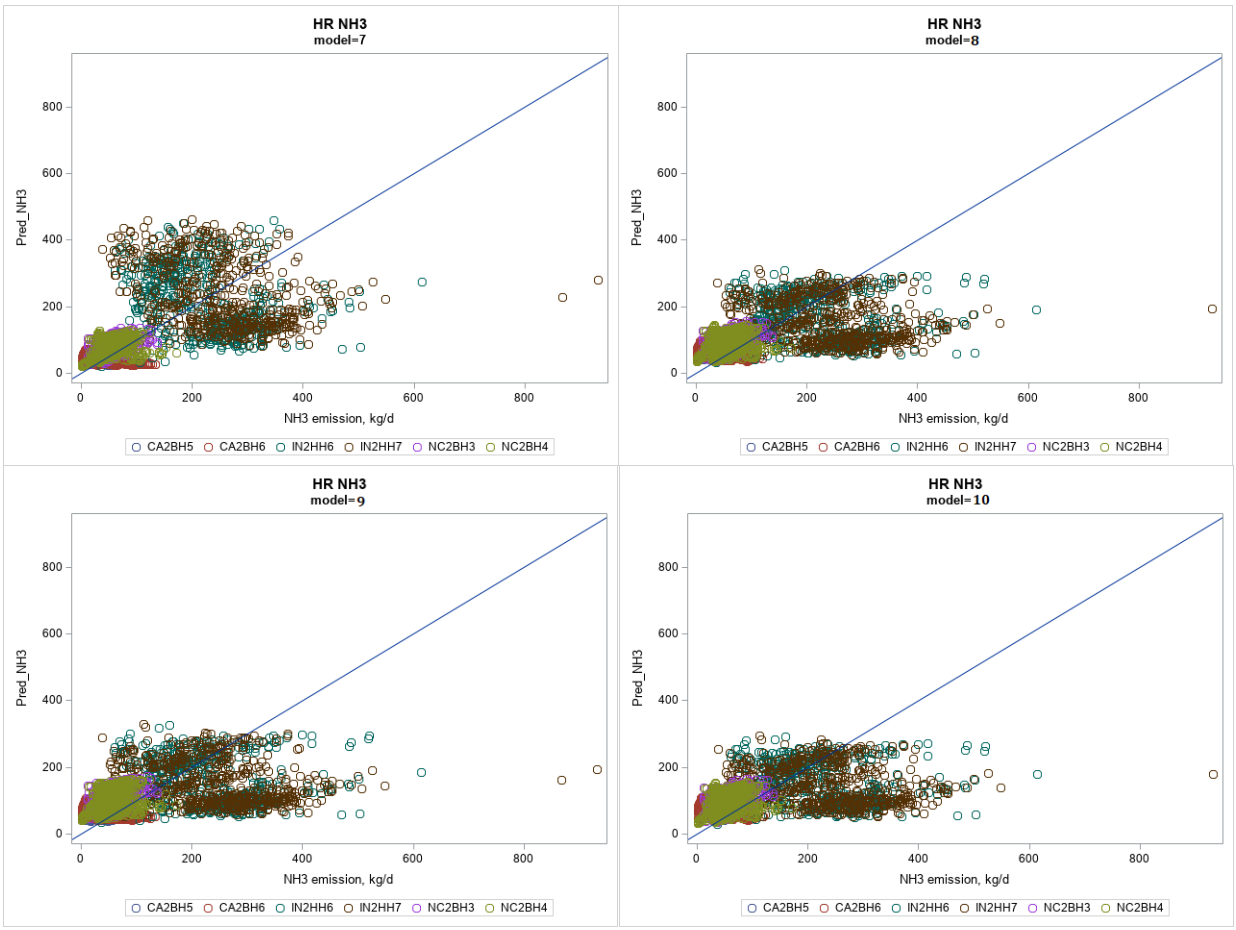

Figure G-2. High rise layer house NH_3 one-to-one plots models 7 through 10.

Table G-5. Parameter and estimates for high rise layer H_2S emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
G-1	Intercept	3.0046	0.0681	<.0001
	Live animal weight	0.0066	0.0004	<.0001
	Ambient temperature	0.0211	0.0016	<.0001
G-2	Intercept	1.8773	0.1120	<.0001
	Live animal weight	0.0067	0.0004	<.0001
	Exhaust temperature	0.0590	0.0036	<.0001
G-3	Intercept	3.0042	0.0663	<.0001
	Inventory	0.0096	0.0005	<.0001
	Ambient temperature	0.0210	0.0016	<.0001
G-4	Intercept	1.8299	0.1083	<.0001
	Inventory	0.0100	0.0005	<.0001
	Exhaust temperature	0.0597	0.0036	<.0001
G-5	Intercept	3.0811	0.0789	<.0001
	Inventory	0.0083	0.0006	<.0001
	Hen age	0.0002	0.0002	**0.2544**
	Ambient temperature	0.0228	0.0018	<.0001
G-6	Intercept	3.4171	0.1452	<.0001
	Inventory	0.0082	0.0005	<.0001
	Ambient temperature	0.0217	0.0016	<.0001
	C	-0.0773	0.1401	**0.5815**
	E	-1.0659	0.1816	<.0001
	F	-0.2473	0.1317	**0.0606**
	M	-0.5080	0.1512	0.0008
	T	0.0000	.	.
G-7	Intercept	3.1374	0.0671	<.0001
	Inventory	0.0096	0.0005	<.0001
	Manure age	-0.0010	0.0002	<.0001
	Ambient temperature	0.0272	0.0021	<.0001
G-8	Intercept	2.7231	0.0726	<.0001
	Inventory	0.0098	0.0005	<.0001
	Ambient temperature	0.0210	0.0016	<.0001
	Ambient relative humidity	0.0038	0.0005	<.0001
G-9	Intercept	1.9138	0.0976	<.0001
	Inventory	0.0117	0.0005	<.0001
	Ambient temperature	0.0229	0.0016	<.0001
	Exhaust relative humidity	0.0124	0.0011	<.0001
G-10	Intercept	3.1737	0.1471	<.0001
	Inventory	0.0082	0.0005	<.0001
	Ambient temperature	0.0217	0.0016	<.0001
	Ambient relative humidity	0.0038	0.0005	<.0001
	C	-0.0987	0.1393	**0.4785**
	E	-1.0994	0.1781	<.0001
	F	-0.2662	0.1308	*0.0421*
	M	-0.5322	0.1513	0.0004
	T	0.0000	.	.

Table G-6. Fit and evaluation statistics for the high rise house H_2S models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
G-1	1600	1630	1630	1626	0.722	9.972	53.393	58.611	-3.776	-3.44
G-2	1519	1549	1550	1546	0.703	10.867	56.378	61.888	1.676	1.527
G-3	1606	1636	1637	1633	0.721	10.017	53.521	58.714	-2.056	-1.874
G-4	1520	1550	1551	1547	0.704	11.014	56.725	62.228	5.399	4.922
G-5	482	514	514	511	0.725	8.471	50.304	50.219	-8.569	-8.584
G-6	1547	1585	1585	1581	0.743	9.499	53.029	58.174	-9.457	-8.621
G-7	2369	2381	2381	2380	0.746	9.436	48.869	54.842	-3.805	-3.391
G-8	1597	1629	1629	1625	0.729	9.962	52.695	58.631	-1.931	-1.735
G-9	1484	1516	1517	1513	0.727	10.666	55.142	60.492	8.507	7.755
G-10	1534	1574	1574	1570	0.752	9.384	52.358	58.257	-10.55	-9.479

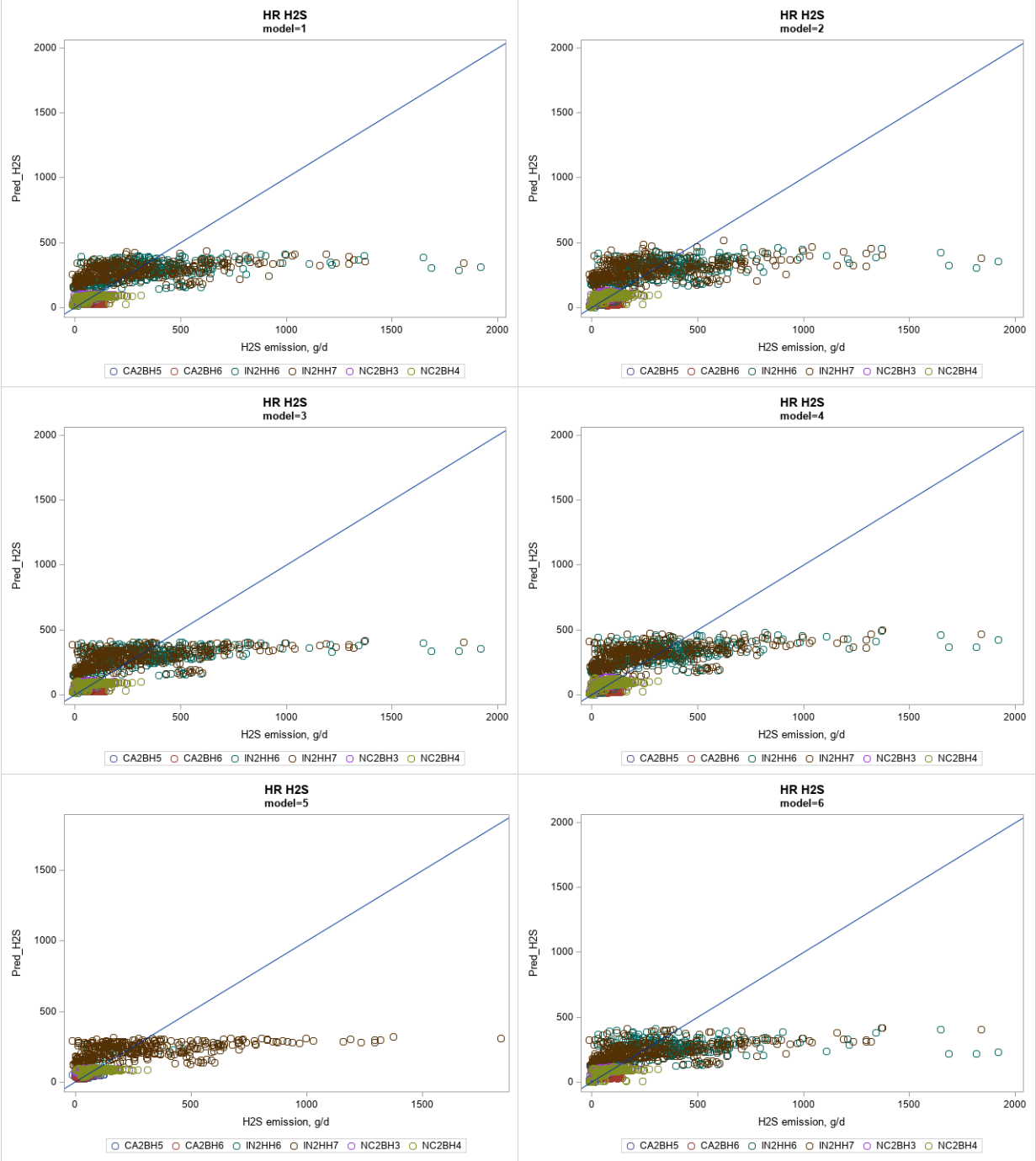

Figure G-3. High rise layer house H_2S one-to-one plots models 1 through 6.

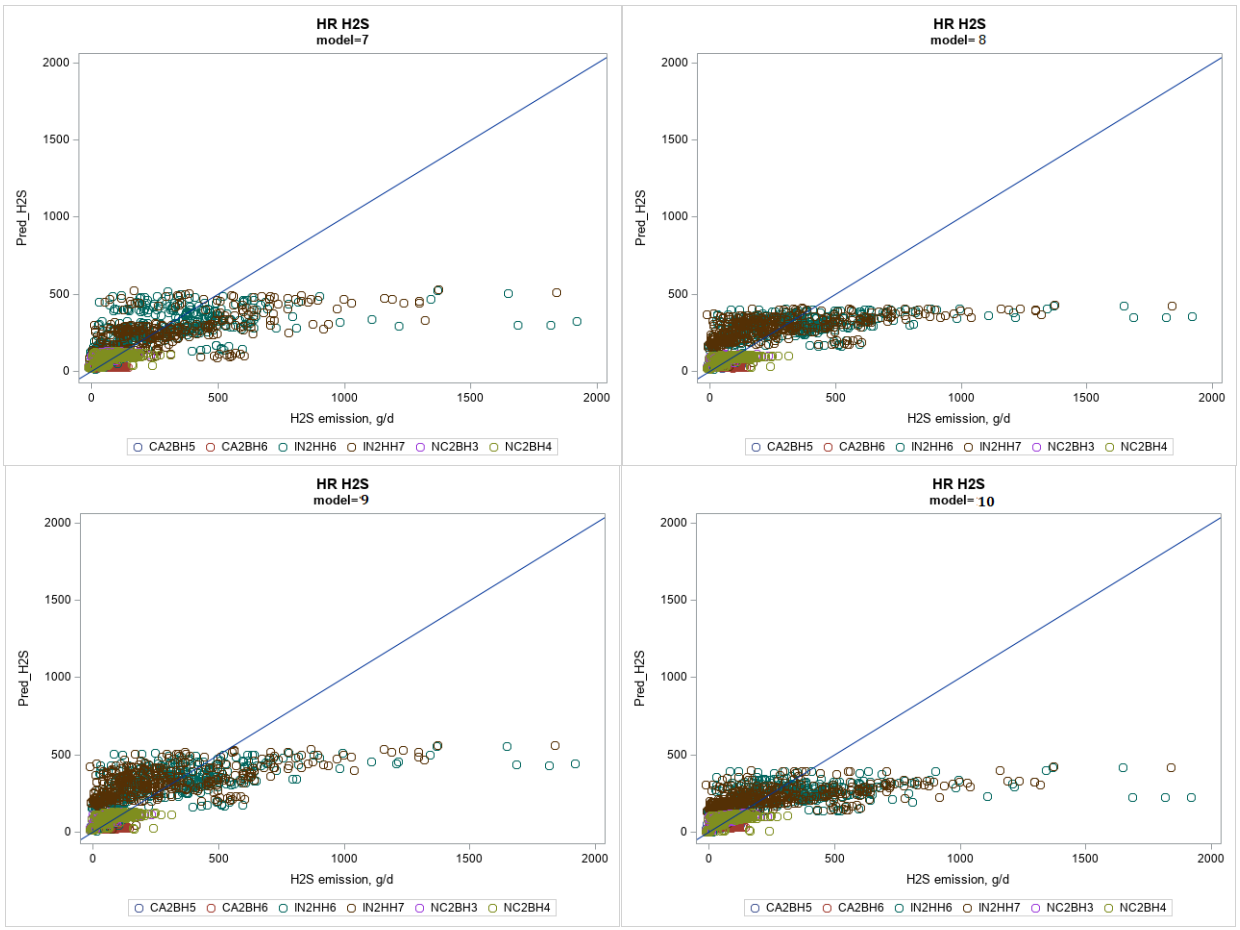

Figure G-4. High rise layer house H_2S one-to-one plots models 7 through 10.

Table G-7. Parameter and estimates for high rise layer PM_{10} emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	6.9224	0.0627	<.0001
	Inventory	0.0073	0.0006	<.0001
P-2	Intercept	7.0833	0.0688	<.0001
	Inventory	0.0072	0.0006	<.0001
	Ambient relative humidity	-0.0023	0.0005	<.0001
P-3	Intercept	7.4170	0.0988	<.0001
	Inventory	0.0073	0.0007	<.0001
	Exhaust relative humidity	-0.0076	0.0011	<.0001
P-4	Intercept	6.8702	0.0675	<.0001
	Inventory	0.0077	0.0005	<.0001
	Ambient relative humidity	-0.0030	0.0005	<.0001
	Ambient temperature	0.0145	0.0015	<.0001
P-5	Intercept	7.1518	0.0990	<.0001
	Inventory	0.0076	0.0006	<.0001
	Ambient temperature	0.0123	0.0015	<.0001
	Exhaust relative humidity	-0.0068	0.0011	<.0001
P-6	Intercept	6.4350	0.1059	<.0001
	Inventory	0.0070	0.0005	<.0001
	Ambient relative humidity	-0.0028	0.0005	<.0001
	Exhaust temperature	0.0300	0.0038	<.0001
P-7	Intercept	6.7862	0.1286	<.0001
	Inventory	0.0070	0.0006	<.0001
	Exhaust temperature	0.0262	0.0037	<.0001
	Exhaust relative humidity	-0.0069	0.0011	<.0001
P-8	Intercept	6.8633	0.0715	<.0001
	Live animal weight	0.0051	0.0004	<.0001
	Ambient temperature	0.0148	0.0016	<.0001
	Ambient relative humidity	-0.0030	0.0005	<.0001
P-9	Intercept	7.1483	0.1021	<.0001
	Live animal weight	0.0049	0.0004	<.0001
	Ambient temperature	0.0126	0.0015	<.0001
	Exhaust relative humidity	-0.0067	0.0011	<.0001
P-10	Intercept	6.4397	0.1090	<.0001
	Live animal weight	0.0046	0.0004	<.0001
	Ambient relative humidity	-0.0028	0.0005	<.0001
	Exhaust temperature	0.0302	0.0038	<.0001
P-11	Intercept	6.7908	0.1316	<.0001
	Live animal weight	0.0045	0.0004	<.0001
	Exhaust temperature	0.0264	0.0037	<.0001
	Exhaust relative humidity	-0.0068	0.0011	<.0001
P-12	Intercept	7.3244	0.1003	<.0001
	Hen age	-0.0004	0.0003	**0.1586**
	Inventory	0.0063	0.0009	<.0001
	Ambient relative humidity	-0.0024	0.0006	0.0001

Model	Parameter	Estimate	Standard Error	p-value
P-13	Intercept	6.9875	0.1355	<.0001
	Inventory	0.0061	0.0006	<.0001
	Ambient relative humidity	-0.0022	0.0005	<.0001
	C	0.4360	0.1437	0.0024
	E	-0.4227	0.1547	0.0064
	F	0.1960	0.1251	**0.1172**
	M	0.3307	0.1596	*0.0385*
	T	0.0000	.	.
P-14	Intercept	6.7482	0.1334	<.0001
	Inventory	0.0067	0.0006	<.0001
	Ambient temperature	0.0143	0.0015	<.0001
	Ambient relative humidity	-0.0029	0.0005	<.0001
	C	0.4552	0.1401	0.0012
	E	-0.3960	0.1491	0.008
	F	0.2117	0.1219	**0.0827**
	M	0.3381	0.1543	*0.0286*
	T	0.0000	.	.
P-15	Intercept	7.0446	0.1363	<.0001
	Inventory	0.0128	0.0013	<.0001
	Manure age	-0.0017	0.0002	<.0001
	Ambient relative humidity	-0.0031	0.0006	<.0001

Table G-8. Fit and evaluation statistics for the high rise house PM_{10} models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
P-1	730	758	758	755	0.591	5.596	57.434	1379.5	178.68	7.44
P-2	718	748	748	745	0.595	5.465	55.407	1343.4	137.45	5.669
P-3	686	716	717	713	0.593	5.666	59.428	1427.3	266.97	11.115
P-4	633	665	666	662	0.644	4.977	50.241	1218.1	111.63	4.604
P-5	623	655	655	652	0.636	5.206	53.831	1292.9	208.25	8.671
P-6	662	694	694	690	0.638	5.018	50.714	1229.6	57.862	2.386
P-7	641	673	673	670	0.633	5.179	53.465	1284.1	145	6.037
P-8	642	674	674	671	0.626	5.087	51.586	1250.7	63.451	2.617
P-9	632	664	664	660	0.62	5.249	53.941	1295.5	125.04	5.206
P-10	671	703	704	700	0.62	5.118	52.064	1262.3	22.303	0.92
P-11	651	683	683	680	0.617	5.238	53.949	1295.7	82.732	3.445
P-12	116	148	148	144	0.611	5.868	55.809	1507.1	-67.5	-2.5
P-13	686	724	724	720	0.608	5.313	52.088	1262.9	12.381	0.511
P-14	598	638	639	634	0.657	4.85	47.508	1151.9	5.412	0.223
P-15	747	779	779	775	0.549	7.281	105.52	2600.6	1600.4	64.938

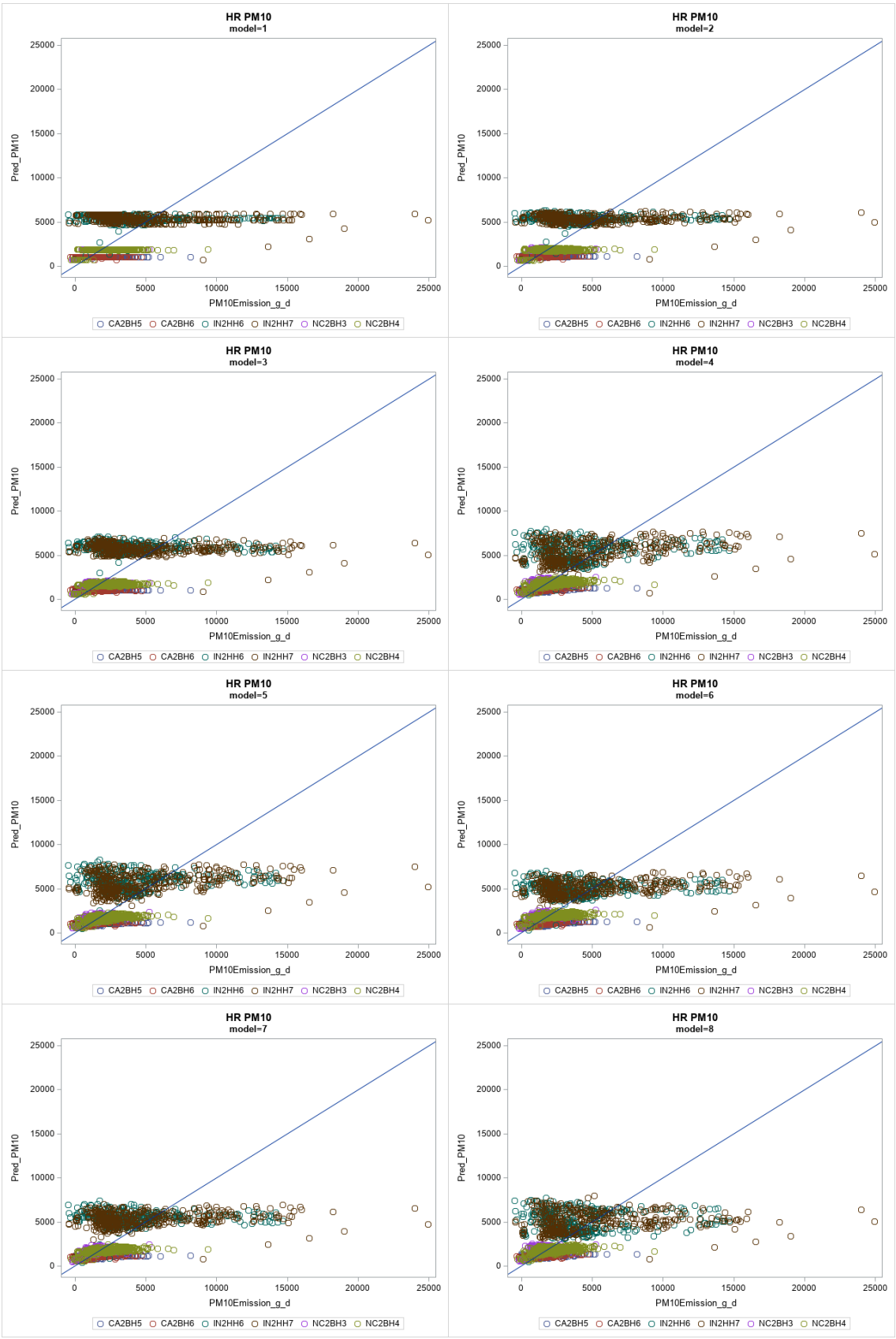

Figure G-5. High rise layer house PM_{10} one-to-one plots for models 1 through 8.

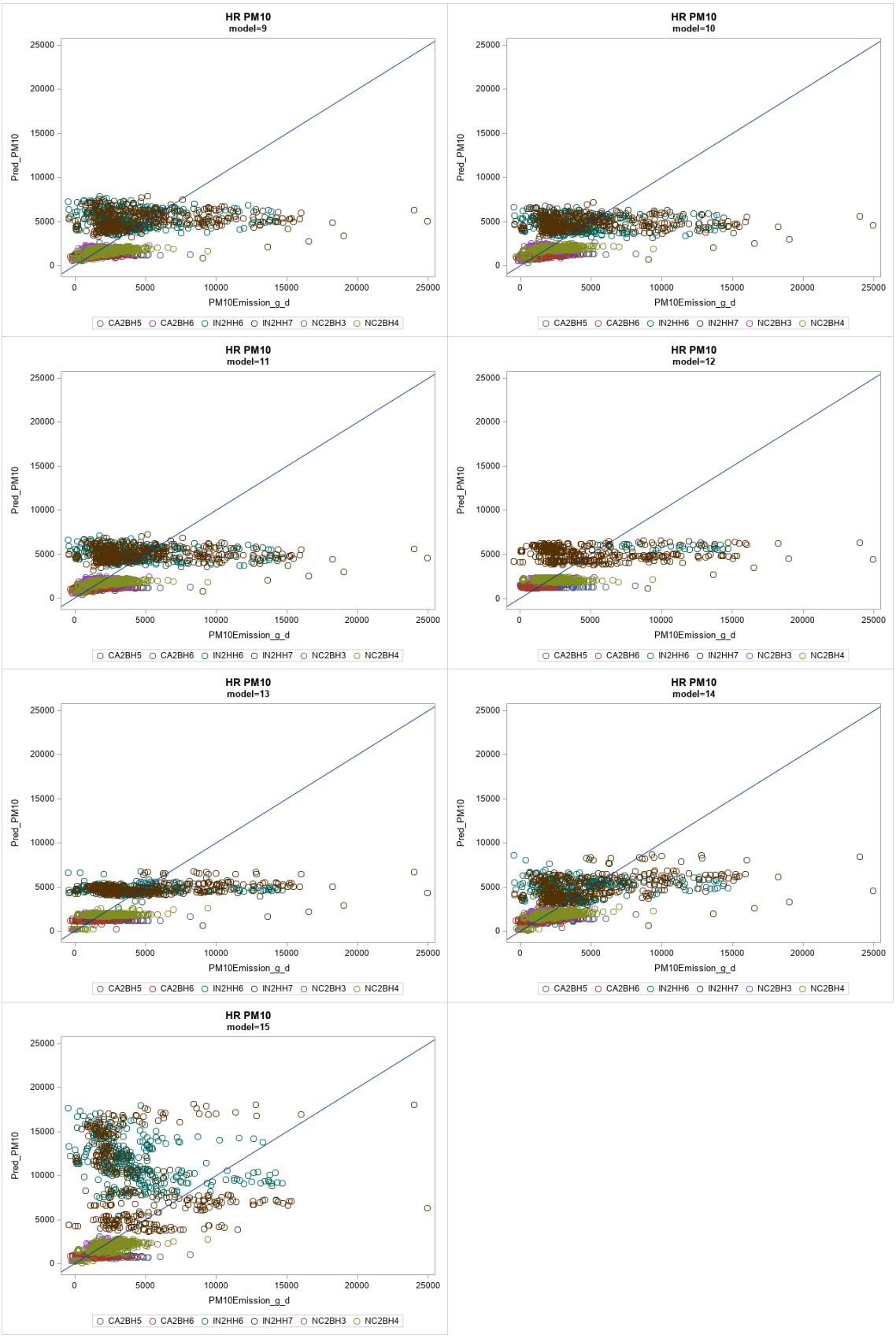

Figure G-6. High rise layer house PM_{10} one-to-one plots for models 9 through 15.

Table G-9. Parameter and estimates for high rise layer $PM_{2.5}$ emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	4.1539	0.2067	<.0001
	Inventory	0.0034	0.0009	0.0037
P-2	Intercept	4.7488	0.2275	<.0001
	Inventory	0.0046	0.0004	<.0001
	Ambient relative humidity	-0.0110	0.0040	0.0068
P-3	Intercept	5.1075	0.9129	<.0001
	Inventory	0.0018	0.0017	**0.2927**
	Exhaust relative humidity	-0.0120	0.0116	**0.3062**
P-4	Intercept	4.6219	0.4614	<.0001
	Inventory	0.0080	0.0034	*0.0295*
	Ambient relative humidity	-0.0181	0.0037	<.0001
	Ambient temperature	0.0510	0.0115	<.0001
P-5	Intercept	4.7297	0.9469	<.0001
	Inventory	0.0020	0.0018	**0.2521**
	Ambient temperature	0.0234	0.0128	**0.074**
	Exhaust relative humidity	-0.0088	0.0121	**0.4655**
P-6	Intercept	3.5383	0.6251	<.0001
	Inventory	0.0055	0.0034	**0.1253**
	Ambient relative humidity	-0.0171	0.0037	<.0001
	Exhaust temperature	0.0861	0.0223	0.0002
P-7	Intercept	4.0751	1.0128	0.0001
	Inventory	0.0017	0.0016	**0.2918**
	Exhaust temperature	0.0566	0.0243	*0.0229*
	Exhaust relative humidity	-0.0145	0.0115	**0.2102**
P-8	Intercept	4.5909	0.4649	<.0001
	Live animal weight	0.0056	0.0023	*0.0266*
	Ambient temperature	0.0514	0.0115	<.0001
	Ambient relative humidity	-0.0182	0.0037	<.0001
P-9	Intercept	4.6253	0.8931	<.0001
	Live animal weight	0.0016	0.0012	**0.1698**
	Ambient temperature	0.0238	0.0130	**0.0733**
	Exhaust relative humidity	-0.0082	0.0114	**0.4712**
P-10	Intercept	3.5260	0.6291	<.0001
	Live animal weight	0.0038	0.0023	**0.1242**
	Ambient relative humidity	-0.0171	0.0037	<.0001
	Exhaust temperature	0.0861	0.0223	0.0002
P-11	Intercept	4.0456	0.9670	<.0001
	Live animal weight	0.0013	0.0011	**0.2376**
	Exhaust temperature	0.0563	0.0244	*0.024*
	Exhaust relative humidity	-0.0145	0.0109	**0.1841**
P-12	Intercept	4.6600	1.6333	*0.0208*
	Hen age	0.0044	0.0069	**0.5523**
	Inventory	0.0052	0.0123	**0.6927**
	Ambient relative humidity	-0.0183	0.0056	0.002
P-13	Intercept	4.7737	0.2244	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Inventory	0.0045	0.0003	<.0001
	Ambient relative humidity	-0.0110	0.0039	0.0065
	C	0.3491	0.4115	**0.4015**
	E	-0.7150	1.6965	**0.6876**
	F	0.0000	.	.
	M	.	.	.
	T	.	.	.
P-14	Intercept	4.8303	0.4447	<.0001
	Inventory	0.0065	0.0031	**0.0526**
	Ambient temperature	0.0516	0.0112	<.0001
	Ambient relative humidity	-0.0183	0.0036	<.0001
	C	0.3710	0.3437	**0.2837**
	E	-1.0497	0.8527	**0.244**
	F	0.0000	.	.
	M	.	.	.
	T	.	.	.
P-15	Intercept	7.3299	1.0741	<.0001
	Inventory	0.0069	0.0052	**0.211**
	Manure age	-0.0103	0.0064	**0.1291**
	Ambient relative humidity	-0.0262	0.0056	<.0001

Table G-10. Fit and evaluation statistics for the high rise house $PM_{2.5}$ models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] kg day^{-1})	NMB[b] (%)
P-1	211	239	242	236	0.273	22.312	125.79	233.25	15.997	8.627
P-2	173	203	207	200	0.364	20.116	116.3	244.83	9.944	4.724
P-3	210	240	243	236	0.272	22.548	121.8	225.86	4.823	2.601
P-4	177	193	194	191	0.733	16.51	78.095	164.4	-44.37	-21.08
P-5	205	237	241	234	0.641	21.312	98.335	182.34	-32.15	-17.34
P-6	181	197	198	195	0.753	16.605	84.537	177.96	-43.62	-20.72
P-7	203	235	239	231	0.688	20.204	98.937	183.45	-32.67	-17.62
P-8	177	193	194	191	0.735	16.479	78.393	165.02	-44.7	-21.23
P-9	205	237	241	234	0.65	21.206	98.682	182.98	-31.46	-16.97
P-10	181	197	198	195	0.747	16.686	85.319	179.6	-42.6	-20.23
P-11	203	235	239	231	0.681	20.164	99.649	184.77	-31.55	-17.02
P-12	97	113	115	111	0.284	24.645	161.21	351.42	122.17	56.045
P-13	171	205	210	202	0.381	19.925	114.6	241.25	7.779	3.695
P-14	174	194	196	192	0.747	15.934	72.31	152.22	-49.53	-23.53
P-15	148	164	165	162	0.688	18.715	88.026	223.43	-15.7	-6.186

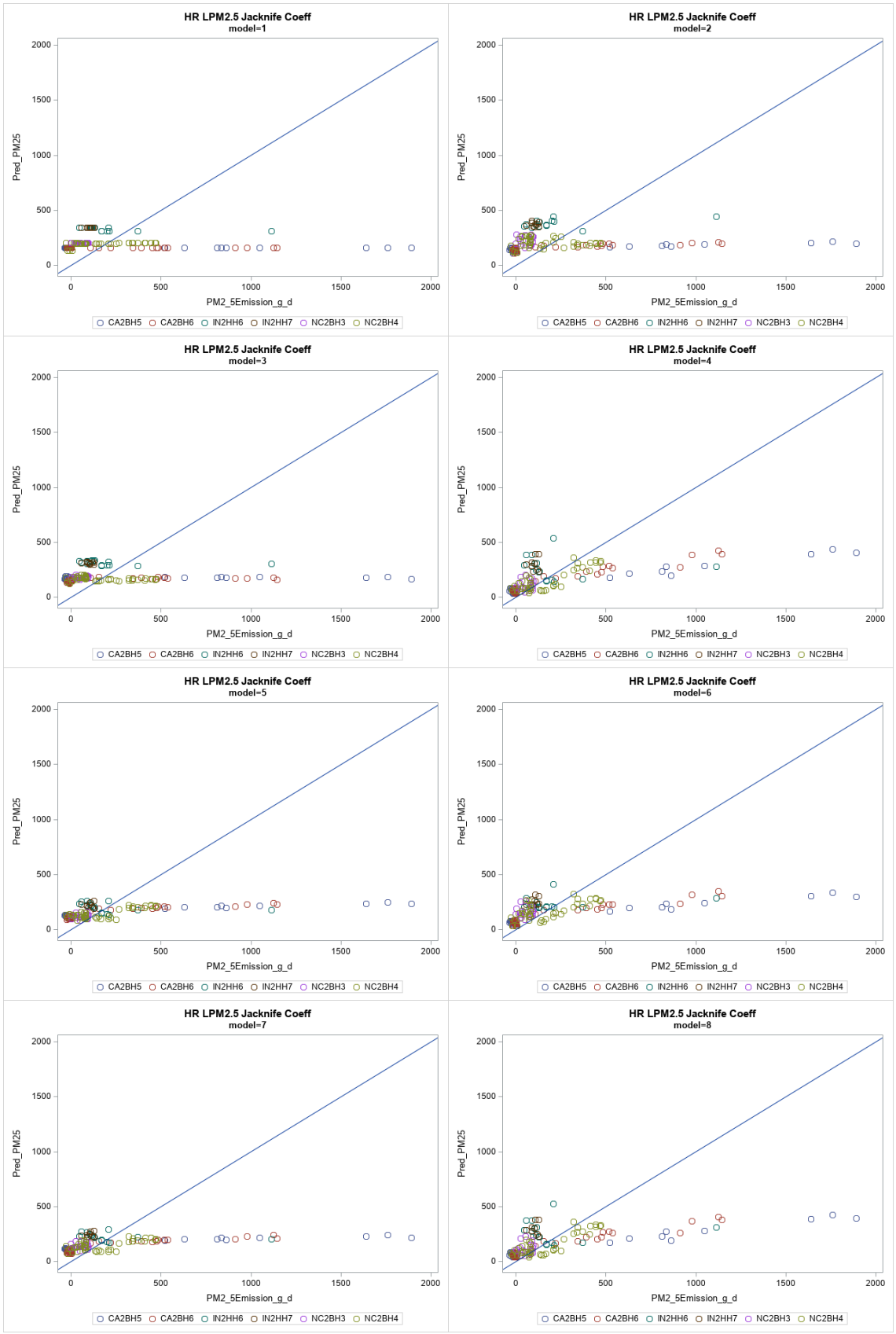

Figure G-7. High rise layer house $PM_{2.5}$ one-to-one plots models 1 through 8.

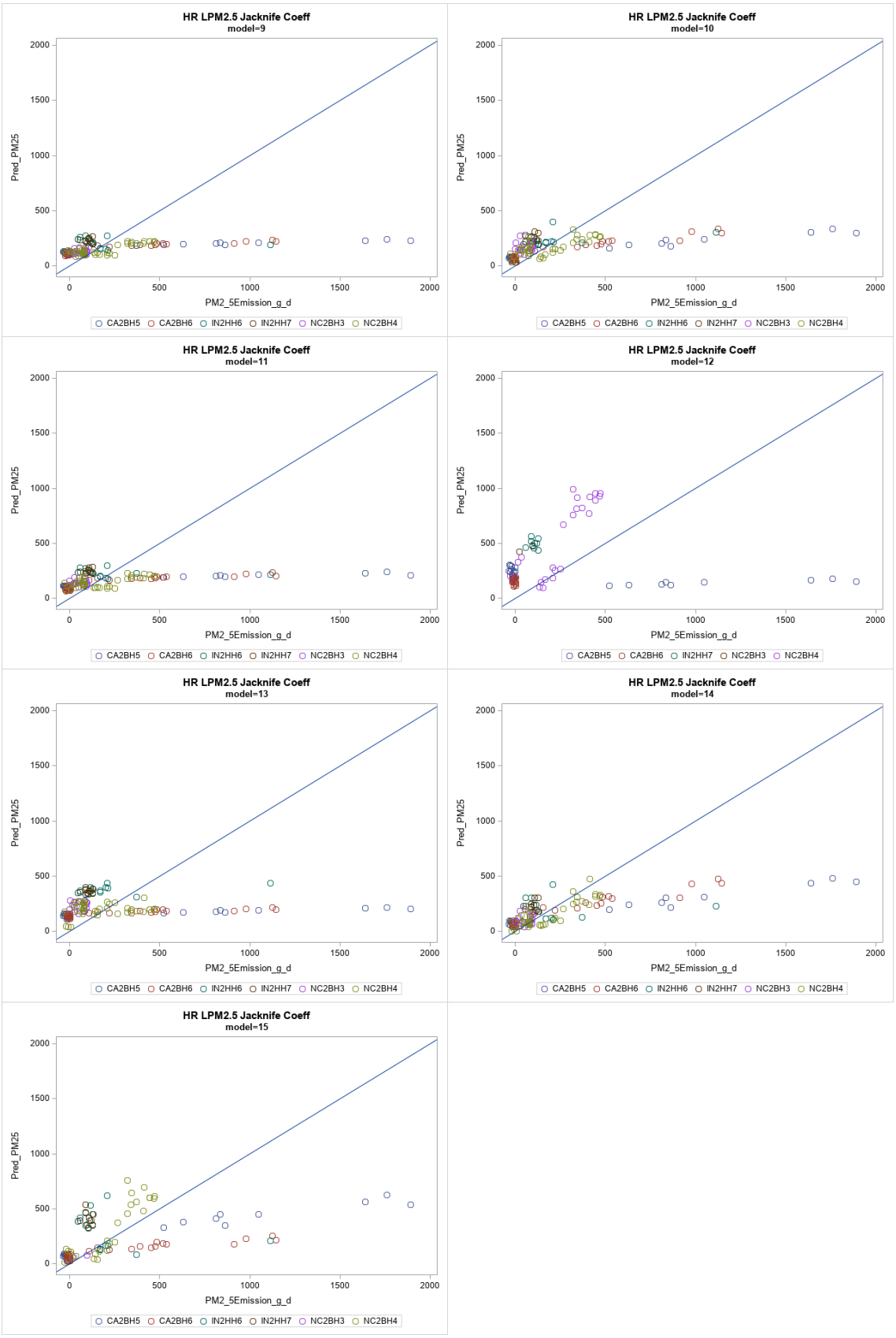

Figure G-8. High rise layer house $PM_{2.5}$ one-to-one plots models 9 through 15.

Table G-11. Parameter and estimates for high rise layer TSP emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	7.5811	0.1685	<.0001
	Inventory	0.0059	0.0014	0.0021
P-2	Intercept	7.9009	0.2166	<.0001
	Inventory	0.0068	0.0010	<.0001
	Ambient relative humidity	-0.0059	0.0028	*0.0378*
P-3	Intercept	8.3610	0.3542	<.0001
	Inventory	0.0054	0.0011	0.0004
	Exhaust relative humidity	-0.0123	0.0053	*0.0207*
P-4	Intercept	7.5995	0.3020	<.0001
	Inventory	0.0079	0.0012	<.0001
	Ambient relative humidity	-0.0058	0.0028	*0.0423*
	Ambient temperature	0.0137	0.0092	**0.1417**
P-5	Intercept	8.1788	0.4033	<.0001
	Inventory	0.0061	0.0013	0.0001
	Ambient temperature	0.0088	0.0084	**0.2948**
	Exhaust relative humidity	-0.0125	0.0053	*0.0198*
P-6	Intercept	7.1395	0.5337	<.0001
	Inventory	0.0073	0.0008	<.0001
	Ambient relative humidity	-0.0056	0.0028	*0.0485*
	Exhaust temperature	0.0312	0.0205	**0.1296**
P-7	Intercept	7.8037	0.5826	<.0001
	Inventory	0.0058	0.0013	0.0009
	Exhaust temperature	0.0235	0.0199	**0.2409**
	Exhaust relative humidity	-0.0125	0.0053	*0.0201*
P-8	Intercept	7.5804	0.3157	<.0001
	Live animal weight	0.0049	0.0009	<.0001
	Ambient temperature	0.0129	0.0094	**0.1751**
	Ambient relative humidity	-0.0049	0.0029	**0.0899**
P-9	Intercept	8.1632	0.4205	<.0001
	Live animal weight	0.0041	0.0012	0.0036
	Ambient temperature	0.0080	0.0085	**0.3531**
	Exhaust relative humidity	-0.0120	0.0054	*0.0267*
P-10	Intercept	7.0480	0.5505	<.0001
	Live animal weight	0.0044	0.0008	<.0001
	Ambient relative humidity	-0.0050	0.0028	**0.0786**
	Exhaust temperature	0.0350	0.0208	**0.0949**
P-11	Intercept	7.7461	0.6150	<.0001
	Live animal weight	0.0039	0.0013	*0.0134*
	Exhaust temperature	0.0249	0.0208	**0.2321**
	Exhaust relative humidity	-0.0120	0.0054	*0.0276*
P-12	Intercept	7.3039	0.2786	<.0001
	Hen age	0.0005	0.0006	**0.3878**
	Inventory	0.0102	0.0012	<.0001
	Ambient relative humidity	-0.0007	0.0023	**0.7637**
P-13	Intercept	8.2312	0.2697	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Inventory	0.0063	0.0009	<.0001
	Ambient relative humidity	-0.0054	0.0028	**0.0601**
	C	0.4012	0.1700	*0.0256*
	E	-3.4233	0.6369	<.0001
	F	-0.2566	0.2260	**0.2902**
	M	.	.	.
	T	0.0000	.	.
P-14	Intercept	7.9620	0.3193	<.0001
	Inventory	0.0073	0.0012	<.0001
	Ambient temperature	0.0141	0.0089	**0.117**
	Ambient relative humidity	-0.0052	0.0029	**0.0698**
	C	0.3540	0.1712	*0.0477*
	E	-3.3807	0.6245	<.0001
	F	-0.2943	0.2154	**0.2055**
	M	.	.	.
	T	0.0000	.	.
P-15	Intercept	7.9217	0.2282	<.0001
	Inventory	0.0071	0.0013	0.0001
	Manure age	-0.0003	0.0010	**0.7503**
	Ambient relative humidity	-0.0059	0.0028	*0.0389*

Table G-12. Fit and evaluation statistics for the high rise house TSP models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
P-1	325	353	355	350	0.408	7.541	43.046	1695.7	92.032	2.336
P-2	315	345	348	342	0.504	7.35	39.647	1592.4	38.911	0.969
P-3	320	350	352	346	0.43	7.533	42.667	1680.8	124.87	3.17
P-4	313	345	347	341	0.532	7.467	40.869	1641.5	64.602	1.608
P-5	318	350	353	347	0.454	7.591	43.365	1708.3	130.37	3.31
P-6	313	345	348	342	0.587	7.289	39.629	1591.7	20.431	0.509
P-7	318	350	353	347	0.499	7.465	42.682	1681.4	104.42	2.651
P-8	316	348	351	345	0.523	7.633	42.094	1690.7	26.341	0.656
P-9	321	353	355	350	0.45	7.666	44.261	1743.6	112.75	2.862
P-10	316	348	350	344	0.592	7.47	40.796	1638.6	-11.48	-0.286
P-11	321	353	355	349	0.503	7.546	43.495	1713.4	79.389	2.015
P-12	76	108	112	104	0.424	6.189	54.975	2264.4	830.37	20.16
P-13	298	334	337	330	0.746	6.506	48.702	1956.1	1365.6	34.001
P-14	295	333	337	329	0.747	6.636	48.65	1954	1322.8	32.933
P-15	315	347	350	344	0.522	7.252	38.515	1546.9	-1.332	-0.033

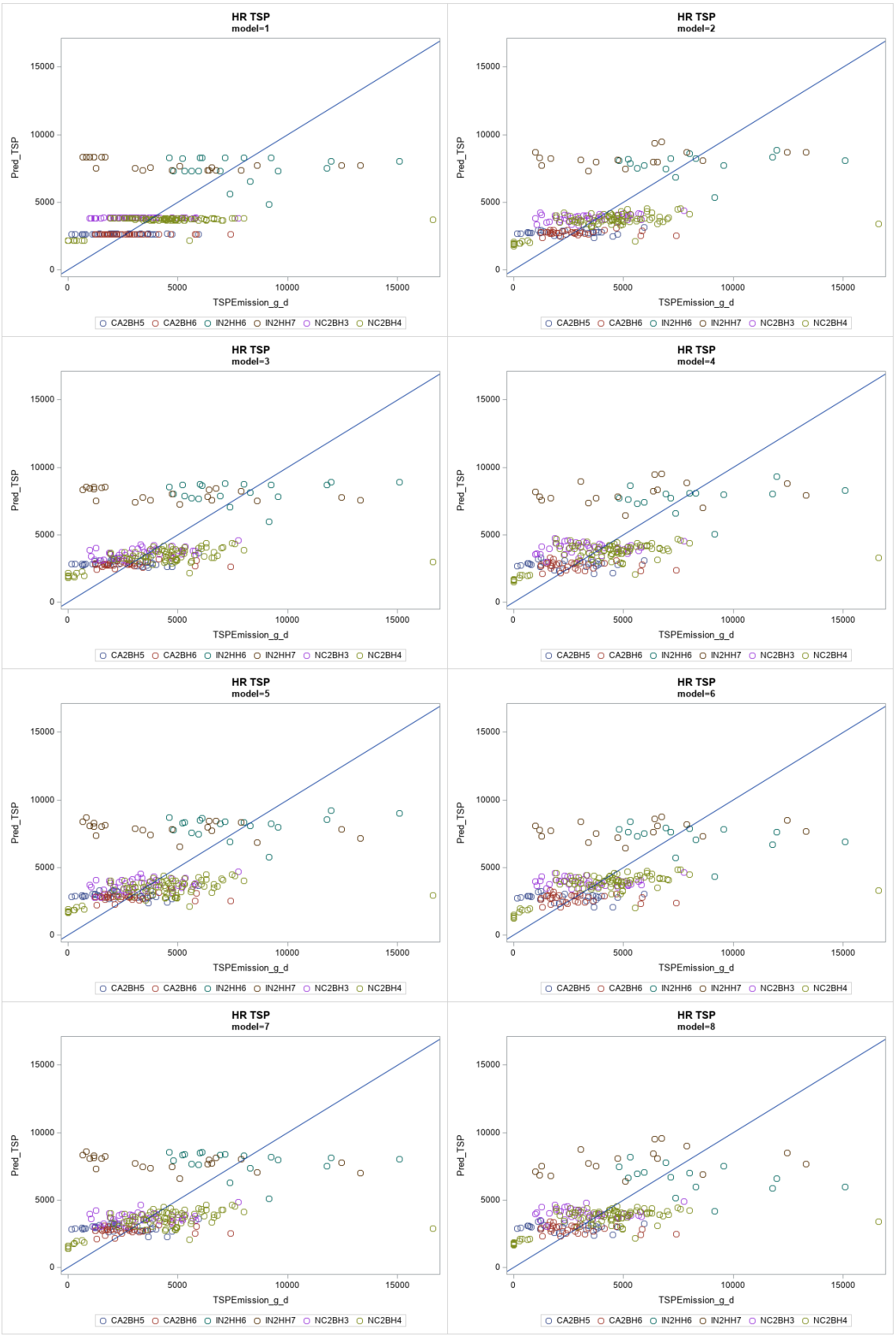

Figure G-9. High rise layer house TSP one-to-one plots models 1 through 8.

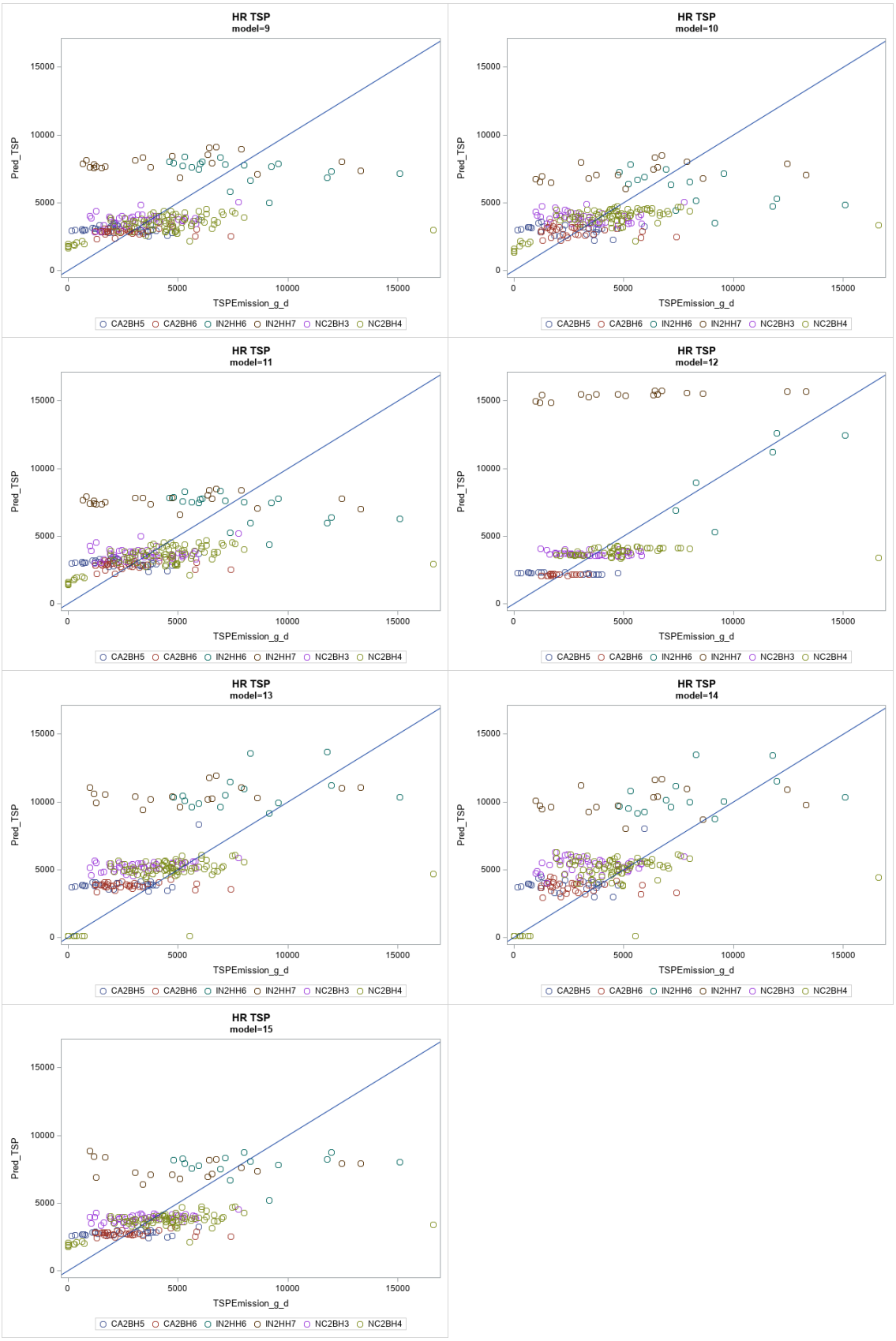

Figure G-10. High rise layer house TSP one-to-one plots models 9 through 15.

Table G-13. Parameter combinations tested as models for manure belt house NH_3 and H_2S emissions.

Model	Parameter
G-1	Intercept, Live animal weight, Ambient temperature
G-2	Intercept, Live animal weight, Exhaust temperature
G-3	Intercept, Inventory, Ambient temperature
G-4	Intercept, Inventory, Exhaust temperature
G-5	Intercept, Inventory, Hen age, Ambient temperature
G-6	Intercept, Inventory, Ambient temperature, Management phase (flock emptying and replacement (E), full flock (F), molting (M), and transition (T))
G-7	Intercept, Inventory, Ambient temperature, Ambient relative humidity
G-8	Intercept, Inventory, Ambient temperature, Exhaust relative humidity
G-9	Intercept, Inventory, Ambient temperature, Ambient relative humidity, Management phase (E,F,M,T)
G-10	Intercept, Inventory
G-11	Intercept, Inventory, Exhaust temperature, Ambient relative humidity
G-12	Intercept, Inventory, Exhaust temperature, Exhaust relative humidity

Table G-14. Parameter combinations tested as models for manure belt house PM_{10}, $PM_{2.5}$, and TSP emissions.

Model	Parameter
P-1	Intercept, Inventory
P-2	Intercept, Inventory, Ambient relative humidity
P-3	Intercept, Inventory, Exhaust relative humidity
P-4	Intercept, Inventory, Ambient relative humidity, Ambient temperature
P-5	Intercept, Inventory, Ambient temperature, Exhaust relative humidity
P-6	Intercept, Inventory, Ambient relative humidity, Exhaust temperature
P-7	Intercept, Inventory, Exhaust temperature, Exhaust relative humidity
P-8	Intercept, Live animal weight, Ambient temperature, Ambient relative humidity
P-9	Intercept, Live animal weight, Ambient temperature, Exhaust relative humidity
P-10	Intercept, Live animal weight, Ambient relative humidity, Exhaust temperature
P-11	Intercept, Live animal weight, Exhaust temperature, Exhaust relative humidity
P-12	Intercept, Hen age, Inventory, Ambient relative humidity
P-13	Intercept, Inventory, Ambient relative humidity, Management phase (C,E,F,M,T)
P-14	Intercept, Inventory, Ambient temperature, Ambient relative humidity, Management phase (C,E,F,M,T)
P-15	Intercept, Inventory, Ambient temperature
P-16	Intercept, Inventory, Exhaust temperature

Table G-15. Parameter and estimates for manure belt house NH_3 emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
G-1	Intercept	2.1289	0.4683	<.0001
	Ambient temperature	0.0291	0.0020	<.0001
	Live animal weight	0.0046	0.0013	0.0005
G-2	Intercept	-0.9761	0.4848	*0.0448*
	Exhaust temperature	0.1698	0.0090	<.0001
	Live animal weight	0.0015	0.0013	**0.2374**
G-3	Intercept	2.5569	0.3831	<.0001
	Ambient temperature	0.0293	0.0021	<.0001
	Inventory	0.0048	0.0015	0.0015
G-4	Intercept	-0.9143	0.4132	*0.0272*
	Exhaust temperature	0.1666	0.0088	<.0001
	Inventory	0.0022	0.0014	**0.1142**
G-5	Intercept	2.1020	3.4798	**0.5496**
	Ambient temperature	0.0264	0.0022	<.0001
	Inventory	0.0074	0.0135	**0.588**
	Hen age	-0.0002	0.0006	**0.7011**
G-6	Intercept	2.5910	0.3934	<.0001
	E	0.3330	0.1926	**0.0841**
	F	-0.1036	0.2313	**0.6543**
	M	-0.2996	0.2681	**0.2641**
	T	0.0000	.	.
	Ambient temperature	0.0294	0.0021	<.0001
	Inventory	0.0051	0.0016	0.0014
G-7	Intercept	2.4392	0.3808	<.0001
	Ambient temperature	0.0294	0.0021	<.0001
	Inventory	0.0047	0.0015	0.0015
	Ambient relative humidity	0.0019	0.0008	*0.0211*
G-8	Intercept	2.0188	0.3852	<.0001
	Ambient temperature	0.0294	0.0021	<.0001
	Inventory	0.0046	0.0015	0.0014
	Exhaust relative humidity	0.0090	0.0018	<.0001
G-9	Intercept	2.4867	0.3905	<.0001
	E	0.2968	0.1905	**0.1194**
	F	-0.1157	0.2279	**0.612**
	M	-0.3139	0.2642	**0.2351**
	T	0.0000	.	.
	Ambient temperature	0.0295	0.0021	<.0001
	Inventory	0.0051	0.0016	0.0014
	Ambient relative humidity	0.0018	0.0008	*0.0289*
G-10	Intercept	2.5726	0.3433	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Inventory	0.0061	0.0014	<.0001
G-11	Intercept	-0.7763	0.4047	**0.0555**
	Inventory	0.0021	0.0014	**0.1302**
	Exhaust temperature	0.1595	0.0085	<.0001
	Ambient relative humidity	0.0011	0.0008	**0.16**
G-12	Intercept	-1.2123	0.4148	0.0036
	Inventory	0.0022	0.0014	**0.113**
	Exhaust temperature	0.1610	0.0090	<.0001
	Exhaust relative humidity	0.0071	0.0017	<.0001

Table G-16. Fit and evaluation statistics for the manure belt house NH_3 models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (kg day^{-1})	MB[b] (kg day^{-1})	NMB[b] (%)
G-1	199	209	209	202	-0.09	12.16	59.25	41.16	10.72	15.43
G-2	178	188	188	182	0.108	11.43	55.73	39.09	9.516	13.57
G-3	316	326	326	319	-0.05	12.77	60.08	41.22	10.65	15.53
G-4	269	279	279	273	0.277	11.47	54.81	37.97	8.49	12.26
G-5	85	97	97	89	-0.19	12.1	57.55	41.26	9.484	13.23
G-6	310	326	327	316	-0.04	12.89	60.91	41.79	11.24	16.39
G-7	288	300	300	292	-0.03	12.55	58.8	40.2	9.866	14.43
G-8	227	239	239	231	0.034	12.11	56.04	38.17	8.501	12.48
G-9	283	301	301	289	-0.02	12.68	59.68	40.8	10.48	15.33
G-10	564	572	572	567	0.487	9.444	38.93	26.97	-0.622	-0.898
G-11	157	169	169	161	0.311	11.12	52.15	35.65	7.084	10.36
G-12	205	217	217	209	0.36	10.69	49.86	34.31	5.944	8.639

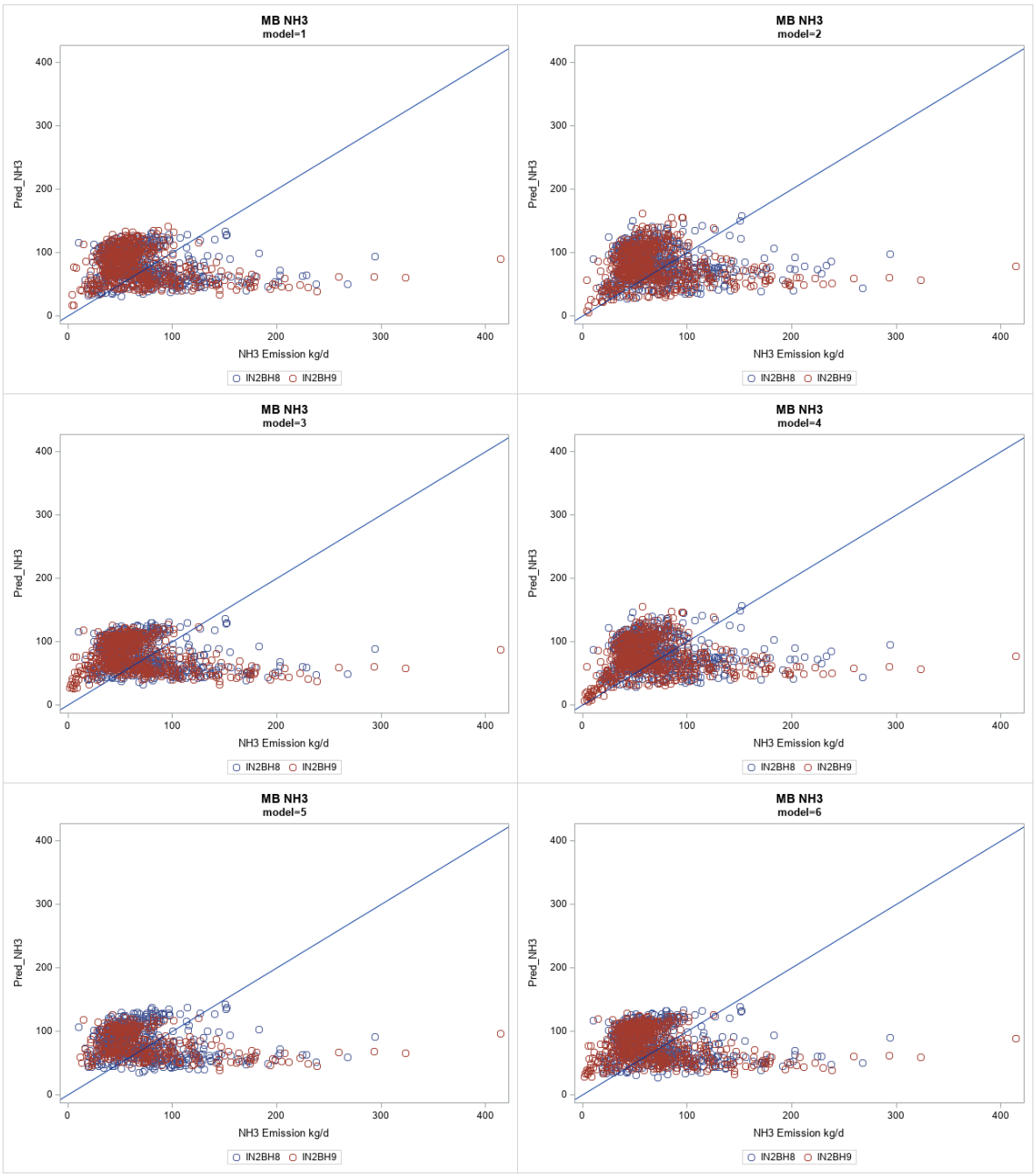

Figure G-11. Manure belt house NH_3 one-to-one plots models 1 through 6.

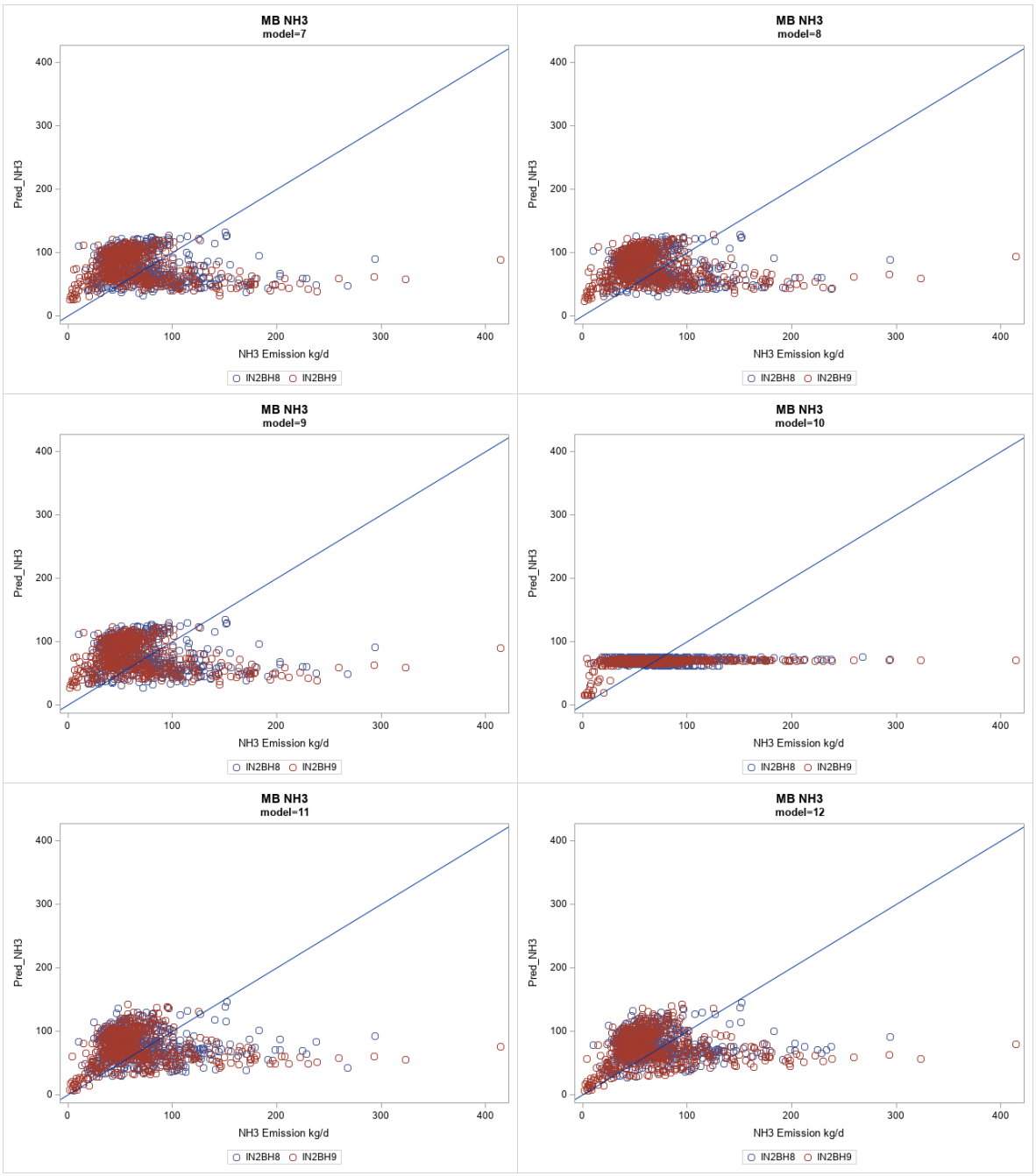

Figure G-12. Manure belt house NH_3 one-to-one plots models 7 through 12.

Table G-17. Parameter and estimates for manure belt house H_2S emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
G-1	Intercept	3.9631	0.4108	<.0001
	Ambient temperature	0.0212	0.0018	<.0001
	Live animal weight	0.0055	0.0012	<.0001
G-2	Intercept	1.6607	0.4924	0.0009
	Exhaust temperature	0.1239	0.0080	<.0001
	Live animal weight	0.0034	0.0013	*0.0117*
G-3	Intercept	4.0179	0.3453	<.0001
	Ambient temperature	0.0212	0.0018	<.0001
	Inventory	0.0076	0.0014	<.0001
G-4	Intercept	1.4304	0.4292	0.001
	Exhaust temperature	0.1225	0.0078	<.0001
	Inventory	0.0058	0.0015	0.0002
G-5	Intercept	5.1432	2.5993	**0.0607**
	Ambient temperature	0.0189	0.0019	<.0001
	Inventory	0.0042	0.0100	**0.6779**
	Hen age	-0.0006	0.0005	**0.2025**
G-6	Intercept	4.0262	0.3491	<.0001
	E	0.7578	0.1809	<.0001
	F	-0.1727	0.2152	**0.4225**
	M	-0.4080	0.2413	**0.0913**
	T	0.0000	.	.
	Ambient temperature	0.0209	0.0018	<.0001
	Inventory	0.0084	0.0015	<.0001
G-7	Intercept	3.7391	0.3430	<.0001
	Ambient temperature	0.0222	0.0018	<.0001
	Inventory	0.0073	0.0014	<.0001
	Ambient relative humidity	0.0048	0.0007	<.0001
G-8	Intercept	3.2727	0.3467	<.0001
	Ambient temperature	0.0230	0.0018	<.0001
	Inventory	0.0075	0.0013	<.0001
	Exhaust relative humidity	0.0121	0.0015	<.0001
G-9	Intercept	3.7730	0.3467	<.0001
	E	0.6634	0.1771	0.0002
	F	-0.2113	0.2105	**0.316**
	M	-0.4586	0.2363	**0.0526**
	T	0.0000	.	.
	Ambient temperature	0.0219	0.0018	<.0001
	Inventory	0.0082	0.0014	<.0001
	Ambient relative humidity	0.0047	0.0007	<.0001
G-10	Intercept	4.3868	0.3996	<.0001
	Inventory	0.0071	0.0016	<.0001

Model	Parameter	Estimate	Standard Error	p-value
G-11	Intercept	1.3286	0.3758	0.0004
	Inventory	0.0054	0.0013	<.0001
	Exhaust temperature	0.1196	0.0072	<.0001
	Ambient relative humidity	0.0041	0.0006	<.0001
G-12	Intercept	0.9834	0.3850	*0.0109*
	Inventory	0.0049	0.0013	0.0001
	Exhaust temperature	0.1240	0.0086	<.0001
	Exhaust relative humidity	0.0096	0.0016	<.0001

Table G-18. Fit and evaluation statistics for the manure belt house H_2S models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
G-1	-136	-122	-122	-131	0.385	5.998	39.52	194.2	16.27	3.312
G-2	43	57	57	48	0.37	6.085	39.88	194.9	19.28	3.944
G-3	-74	-60	-59	-69	0.482	6.227	39.09	189.5	11.6	2.394
G-4	76	90	90	81	0.522	6.051	38.77	187	13.41	2.781
G-5	-215	-199	-199	-210	0.411	5.861	36.81	186.3	6.171	1.219
G-6	-97	-77	-77	-90	0.516	6.087	38.3	185.6	10.62	2.191
G-7	-122	-106	-106	-116	0.505	6.180	38.39	186	7.55	1.559
G-8	-165	-149	-149	-159	0.566	5.938	36.77	176.4	3.694	0.77
G-9	-143	-121	-120	-135	0.544	6.013	37.44	181.4	6.212	1.282
G-10	304	316	316	308	0.49	6.137	37.19	179.4	-5.611	-1.163
G-11	-226	-210	-210	-220	0.56	5.968	38.11	184.6	8.143	1.681
G-12	147	159	159	151	0.576	5.744	36.21	173	4.882	1.022

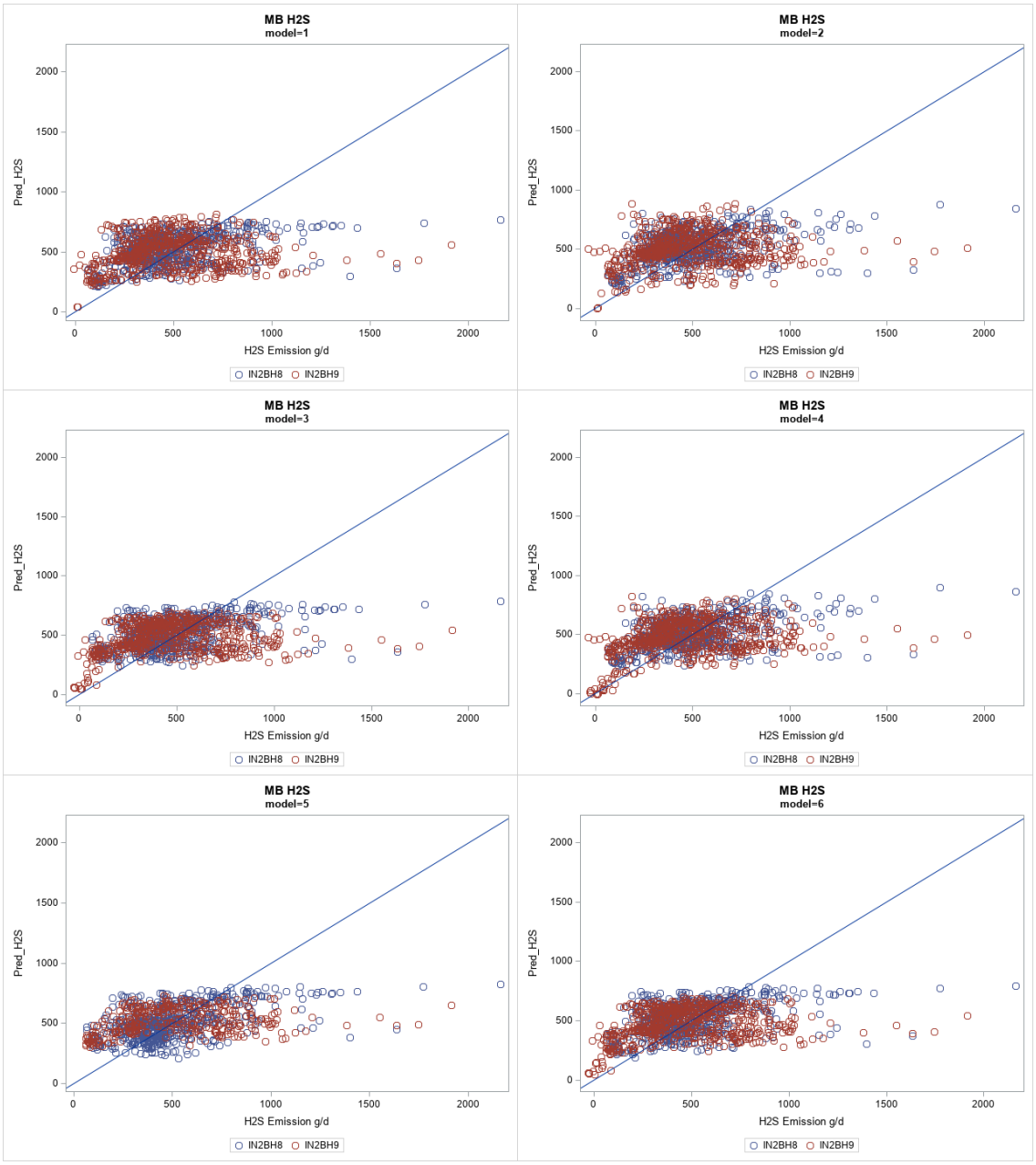

Figure G-13. Manure belt house H_2S one-to-one plots models 1 through 6.

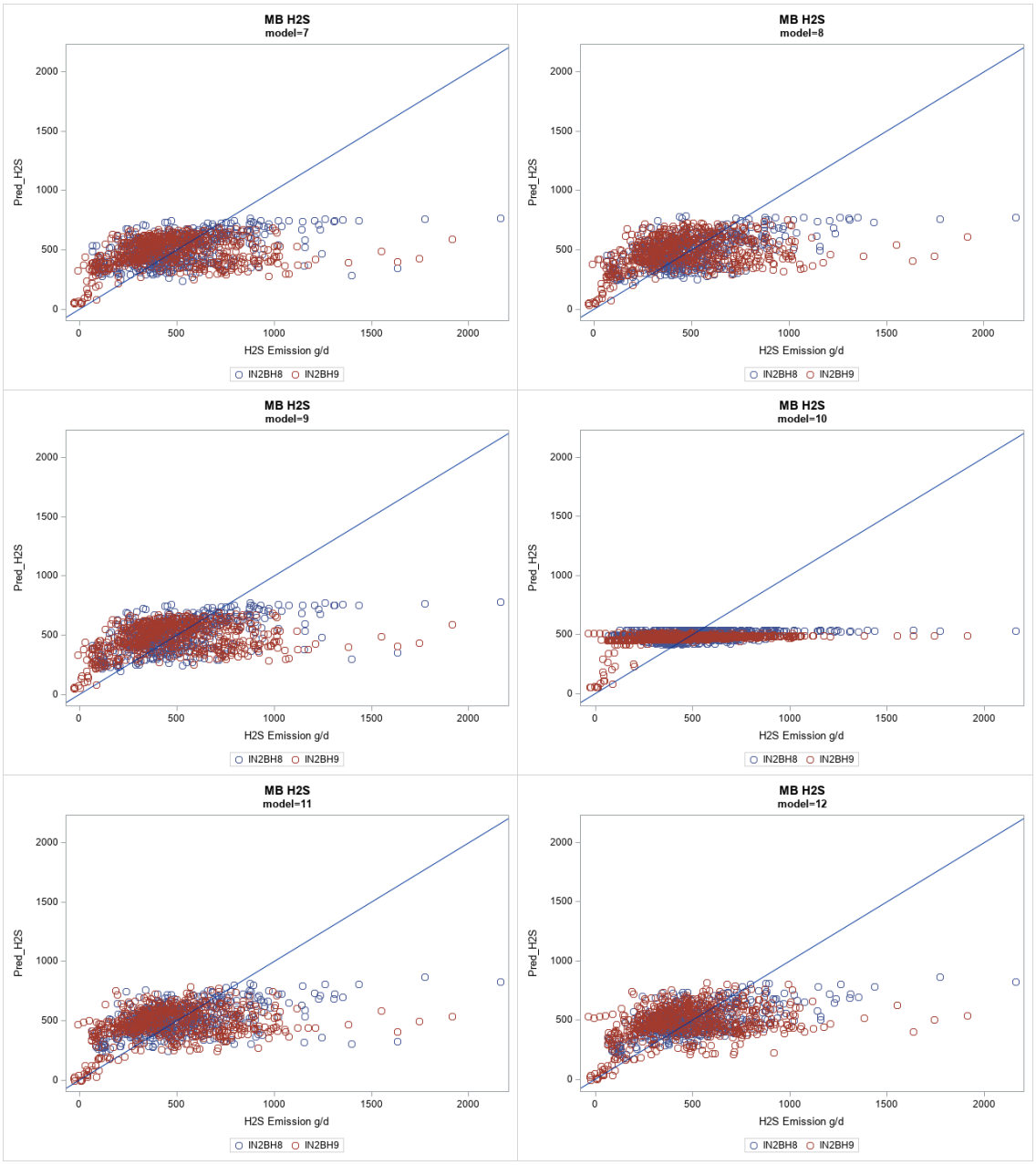

Figure G-14. Manure belt house H_2S one-to-one plots models 7 through 12.

Table G-19. Parameter and estimates for manure belt house PM_{10} emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	6.631005	0.74268	<.0001
	Inventory	0.007205	0.00304	*0.0186*
P-2	Intercept	6.701076	0.76935	<.0001
	Inventory	0.007479	0.00306	*0.0153*
	Ambient relative humidity	-0.001965	0.00392	**0.6168**
P-3	Intercept	7.118863	0.83707	<.0001
	Inventory	0.007319	0.00304	*0.0168*
	Exhaust relative humidity	-0.008078	0.00731	**0.2704**
P-4	Intercept	6.916558	0.80465	<.0001
	Inventory	0.007424	0.00306	*0.016*
	Ambient relative humidity	-0.003651	0.00426	**0.3923**
	Ambient temperature	-0.006758	0.00683	**0.3233**
P-5	Intercept	7.331233	0.86758	<.0001
	Inventory	0.007218	0.00303	*0.0181*
	Exhaust relative humidity	-0.009859	0.00751	**0.1902**
	Ambient temperature	-0.005743	0.00643	**0.3728**
P-6	Intercept	8.177526	0.96556	<.0001
	Inventory	0.010336	0.00316	0.0012
	Ambient relative humidity	-0.005075	0.00404	**0.2102**
	Exhaust temperature	-0.073958	0.02775	0.0083
P-7	Intercept	8.165323	0.97841	<.0001
	Inventory	0.009413	0.00313	0.003
	Exhaust relative humidity	-0.008534	0.00722	**0.2386**
	Exhaust temperature	-0.057587	0.02677	*0.033*
P-8	Intercept	7.630943	1.11232	<.0001
	Live animal weight	0.00319	0.00309	**0.3041**
	Ambient temperature	-0.008317	0.00699	**0.2353**
	Ambient relative humidity	-0.003303	0.00431	**0.4437**
P-9	Intercept	7.95699	1.07648	<.0001
	Live animal weight	0.003787	0.0031	**0.2245**
	Ambient temperature	-0.008271	0.00666	**0.216**
	Exhaust relative humidity	-0.0119	0.00775	**0.1256**
P-10	Intercept	8.87744	1.1733	<.0001
	Live animal weight	0.006543	0.00322	*0.0444*
	Exhaust temperature	-0.090975	0.03098	0.0036
	Ambient relative humidity	-0.004612	0.00408	**0.2588**
P-11	Intercept	8.890437	1.10805	<.0001
	Live animal weight	0.006797	0.00329	*0.0411*
	Exhaust temperature	-0.07933	0.03034	0.0096
	Exhaust relative humidity	-0.011355	0.00736	**0.1241**
P-12	Intercept	7.065611	2.94541	*0.0182*
	Hen age	-0.001711	0.00041	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Inventory	0.008101	0.01154	**0.4844**
	Ambient relative humidity	-0.00372	0.0041	**0.3646**
P-13	Intercept	6.435778	0.77396	<.0001
	F	-2.23531	1.07099	*0.0376*
	M	-2.175865	1.11679	**0.0522**
	T	0	.	.
	Inventory	0.017791	0.00573	0.0021
	Ambient relative humidity	-0.00269	0.00396	**0.4973**
P-14	Intercept	6.648885	0.8072	<.0001
	F	-2.265321	1.06807	*0.0346*
	M	-2.265121	1.11403	*0.0428*
	T	0	.	.
	Inventory	0.017891	0.00571	0.0019
	Ambient temperature	-0.007059	0.00688	**0.3062**
	Ambient relative humidity	-0.004377	0.00426	**0.3052**
P-15	Intercept	6.705426	0.75615	<.0001
	Inventory	0.007092	0.00305	*0.0209*
	Ambient temperature	-0.003622	0.00626	**0.5633**
P-16	Intercept	7.687405	0.90053	<.0001
	Inventory	0.009193	0.00312	0.0035
	Exhaust temperature	-0.058102	0.02672	*0.031*

Table G-20. Fit and evaluation statistics for the manure belt house PM_{10} models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
P-1	1,590	1,602	1,602	1,594	0.166	9.608	85.2	4,620	-61.72	-1.138
P-2	1,580	1,594	1,594	1,585	0.174	9.603	84.9	4,624	-76.38	-1.403
P-3	1,569	1,583	1,583	1,574	0.174	9.625	84.61	4,574	-77.96	-1.442
P-4	1,579	1,595	1,595	1,585	0.2	9.597	84.89	4,623	-48.7	-0.894
P-5	1,568	1,584	1,584	1,574	0.196	9.616	84.76	4,582	-51.06	-0.945
P-6	1,574	1,590	1,590	1,579	0.283	9.291	83.43	4,543	-22.48	-0.413
P-7	1,565	1,581	1,581	1,570	0.264	9.384	83.9	4,535	-32.44	-0.6
P-8	1,574	1,590	1,590	1,579	0.148	9.806	86.29	4,722	-24.61	-0.45
P-9	1,562	1,578	1,578	1,568	0.153	9.827	85.7	4,655	-39.03	-0.718
P-10	1,568	1,584	1,584	1,573	0.271	9.482	83.79	4,585	-48.54	-0.887
P-11	1,558	1,574	1,574	1,563	0.259	9.544	83.52	4,537	-63.89	-1.176
P-12	1,209	1,225	1,225	1,214	0.386	8.113	73.18	3,295	58.71	1.304
P-13	1,576	1,594	1,594	1,582	0.247	9.361	83.65	4,555	-101.5	-1.864
P-14	1,575	1,595	1,595	1,582	0.268	9.361	83.51	4,548	-74.76	-1.373
P-15	1,590	1,604	1,604	1,595	0.178	9.61	85.29	4,624	-40.12	-0.74
P-16	1,586	1,600	1,600	1,591	0.253	9.374	84.4	4,576	-0.421	-0.008

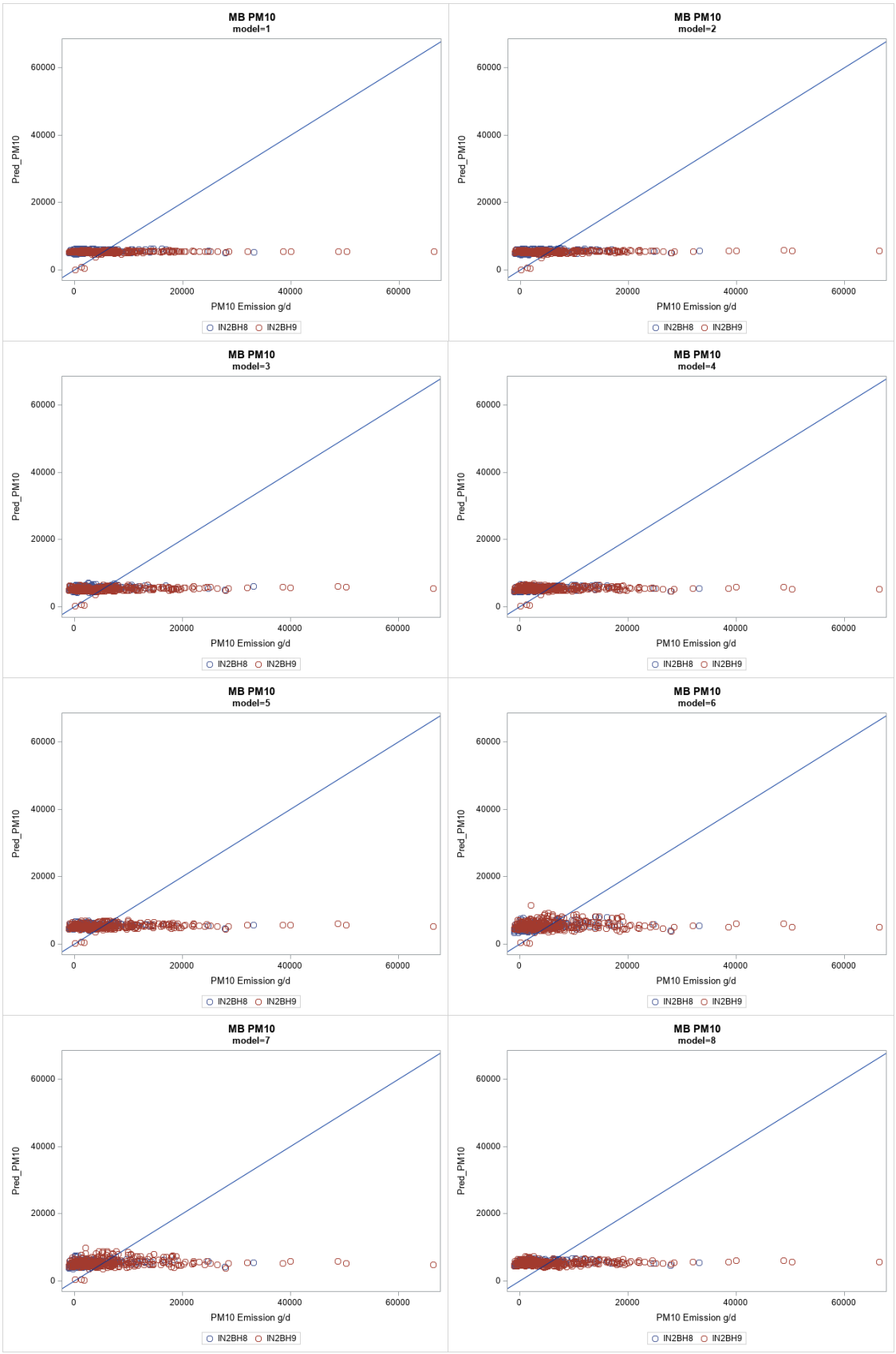

Figure G-15. Manure belt house PM_{10} one-to-one plots models 1 through 8.

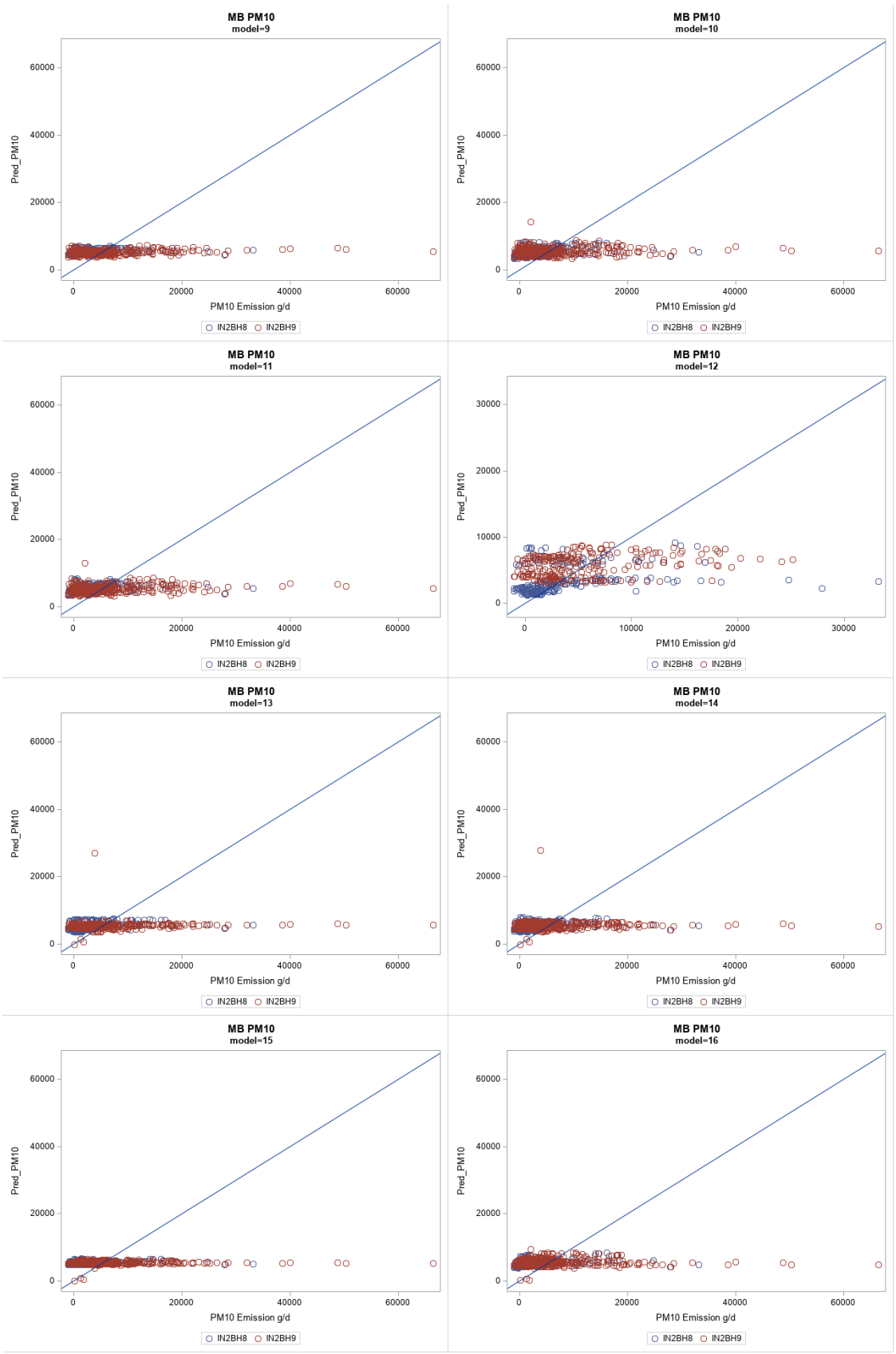

Figure G-16. Manure belt house PM_{10} one-to-one plots models 9 through 16.

Table G-21. Parameter and estimates for manure belt house $PM_{2.5}$ emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	-127.4489	61.0184	**0.0681**
	Inventory	0.534577	0.24656	**0.0604**
P-2	Intercept	-126.759	60.9479	**0.0904**
	Inventory	0.531631	0.24755	**0.0819**
	Ambient relative humidity	0.000565	0.03137	**0.9858**
P-3	Intercept	37.035887	29.4546	**0.2794**
	Inventory	-0.094695	0.11911	**0.474**
	Exhaust relative humidity	-0.128115	0.03386	0.0049
P-4	Intercept	-117.9991	89.9341	**0.2219**
	Inventory	0.495946	0.36299	**0.2041**
	Ambient relative humidity	0.002538	0.03018	**0.9336**
	Ambient temperature	-0.01164	0.0707	**0.8712**
P-5	Intercept	-133.8634	83.2194	**0.1316**
	Inventory	0.591108	0.33948	**0.1046**
	Exhaust relative humidity	-0.115588	0.07929	**0.1596**
	Ambient temperature	-0.026486	0.06113	**0.67**
P-6	Intercept	-121.6364	85.7067	**0.1828**
	Inventory	0.513706	0.32419	**0.143**
	Ambient relative humidity	0.001609	0.03052	**0.9583**
	Exhaust temperature	-0.029674	0.33459	**0.9305**
P-7	Intercept	-131.4002	80.2027	**0.1237**
	Inventory	0.585801	0.30869	**0.0795**
	Exhaust relative humidity	-0.096143	0.06461	**0.1506**
	Exhaust temperature	-0.099247	0.29081	**0.7373**
P-8	Intercept	15.313806	17.5534	**0.4379**
	Live animal weight	-0.023061	0.05245	**0.6874**
	Ambient temperature	-0.027824	0.0518	**0.6043**
	Ambient relative humidity	-0.028845	0.03358	**0.3982**
P-9	Intercept	35.229203	11.5459	0.0059
	Live animal weight	-0.050831	0.02658	**0.0715**
	Ambient temperature	-0.045538	0.03403	**0.1936**
	Exhaust relative humidity	-0.174683	0.04196	0.0004
P-10	Intercept	16.694338	10.5833	**0.2096**
	Live animal weight	-0.019203	0.03677	**0.6328**
	Exhaust temperature	-0.107616	0.21044	**0.624**
	Ambient relative humidity	-0.030398	0.03209	**0.3531**
P-11	Intercept	33.520989	12.4481	*0.0166*
	Live animal weight	-0.037796	0.02139	**0.104**
	Exhaust temperature	-0.19216	0.16949	**0.2727**
	Exhaust relative humidity	-0.148561	0.0359	0.0009
P-12	Intercept	-127.1099	54.6499	*0.0449*
	Hen age	0.000199	0.0049	**0.9701**

Model	Parameter	Estimate	Standard Error	p-value
	Inventory	0.516362	0.21867	*0.0419*
	Ambient relative humidity	0.056541	0.02641	**0.0536**
P-13	Intercept	-94.28449	51.693	**0.0942**
	F	-1.46145	1.06395	**0.1939**
	M	0	.	.
	Inventory	0.411612	0.20817	**0.0726**
	Ambient relative humidity	-0.024659	0.03084	**0.4305**
P-14	Intercept	-96.14378	76.8941	**0.2282**
	F	-1.475749	1.37378	**0.3033**
	M	0	.	.
	Inventory	0.419524	0.31091	**0.195**
	Ambient temperature	0.004319	0.07322	**0.9543**
	Ambient relative humidity	-0.026112	0.03459	**0.4569**
P-15	Intercept	-118.1904	87.2564	**0.199**
	Inventory	0.497444	0.3514	**0.1809**
	Ambient temperature	-0.011043	0.06202	**0.8608**
P-16	Intercept	-119.6086	85.0107	**0.1815**
	Inventory	0.507481	0.3233	**0.1408**
	Exhaust temperature	-0.044218	0.3062	**0.8869**

Table G-22. Fit and evaluation statistics for the manure belt house $PM_{2.5}$ models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
P-1	108	120	123	112	0.216	24.72	158.3	485.9	322.4	105.1
P-2	104	118	123	109	0.229	24.48	153.1	483	314.4	99.61
P-3	103	117	122	108	0.326	19.45	152	466.3	202.7	66.04
P-4	104	120	127	110	0.201	25.86	172.6	544.7	393.5	124.7
P-5	101	117	123	106	0.366	27.26	486.8	1536	1415	448.3
P-6	104	120	127	110	0.221	25.05	159.3	502.6	344.4	109.1
P-7	104	120	126	110	0.356	26.5	362	1111	990.8	322.9
P-8	106	122	128	112	0.326	22.59	91.43	288.5	44.7	14.16
P-9	97	113	119	102	0.514	18.95	175.4	553.6	415.2	131.6
P-10	106	122	128	112	0.351	22.05	89.05	281	35.57	11.27
P-11	102	118	124	108	0.514	16.93	116	356	197.7	64.42
P-12	83	99	107	88	0.105	31.62	385.4	1141	1021	345
P-13	101	117	124	107	0.424	22.27	150.6	475.3	337.3	106.9
P-14	101	119	128	108	0.441	21.66	141.2	445.5	305.2	96.72
P-15	104	118	123	109	0.209	25.63	168.4	531.5	375	118.8
P-16	108	122	126	112	0.206	25.58	166.8	511.8	361.7	117.9

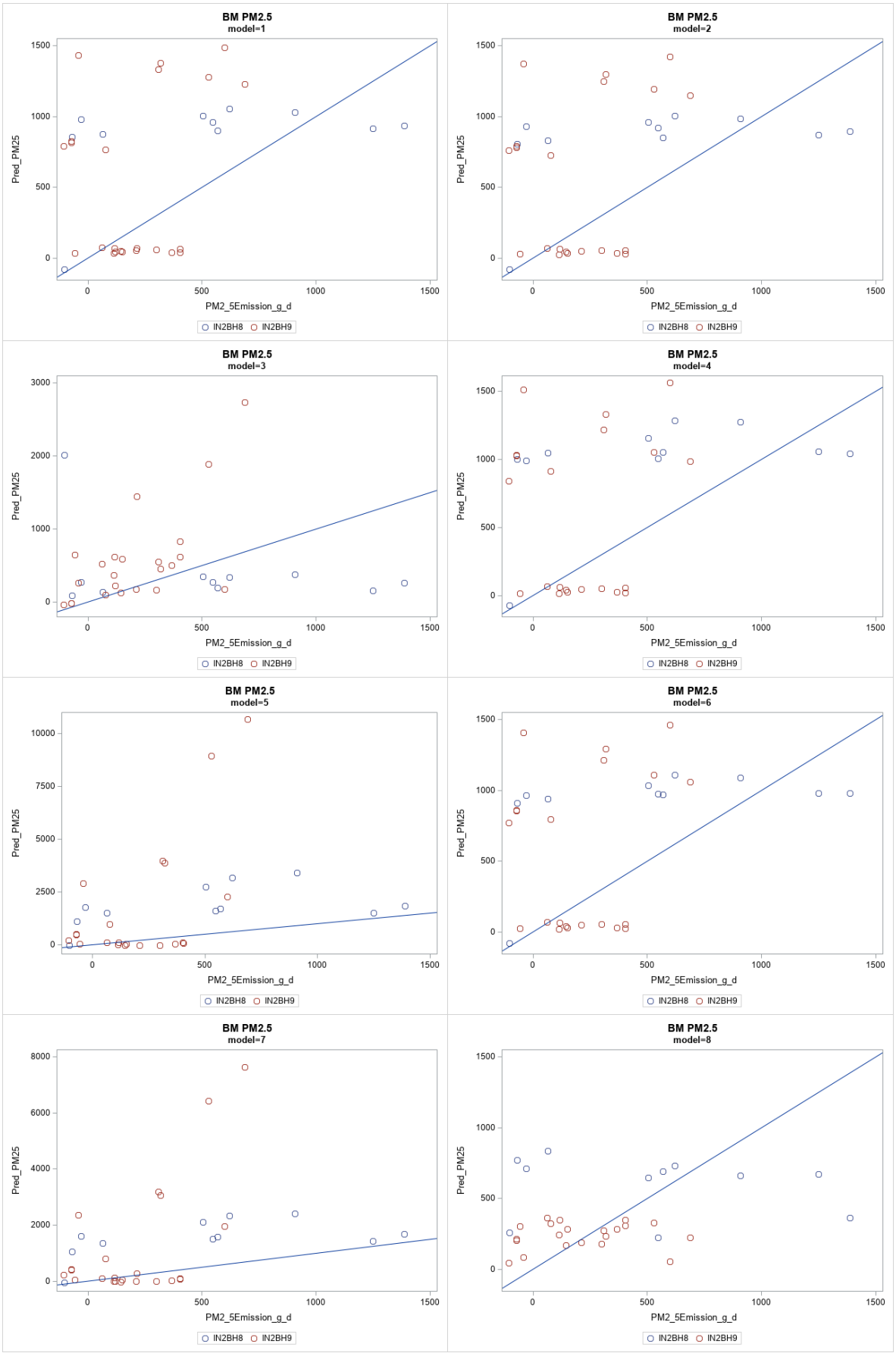

Figure G-17. Manure belt house $PM_{2.5}$ one-to-one plots models 1 through 8.

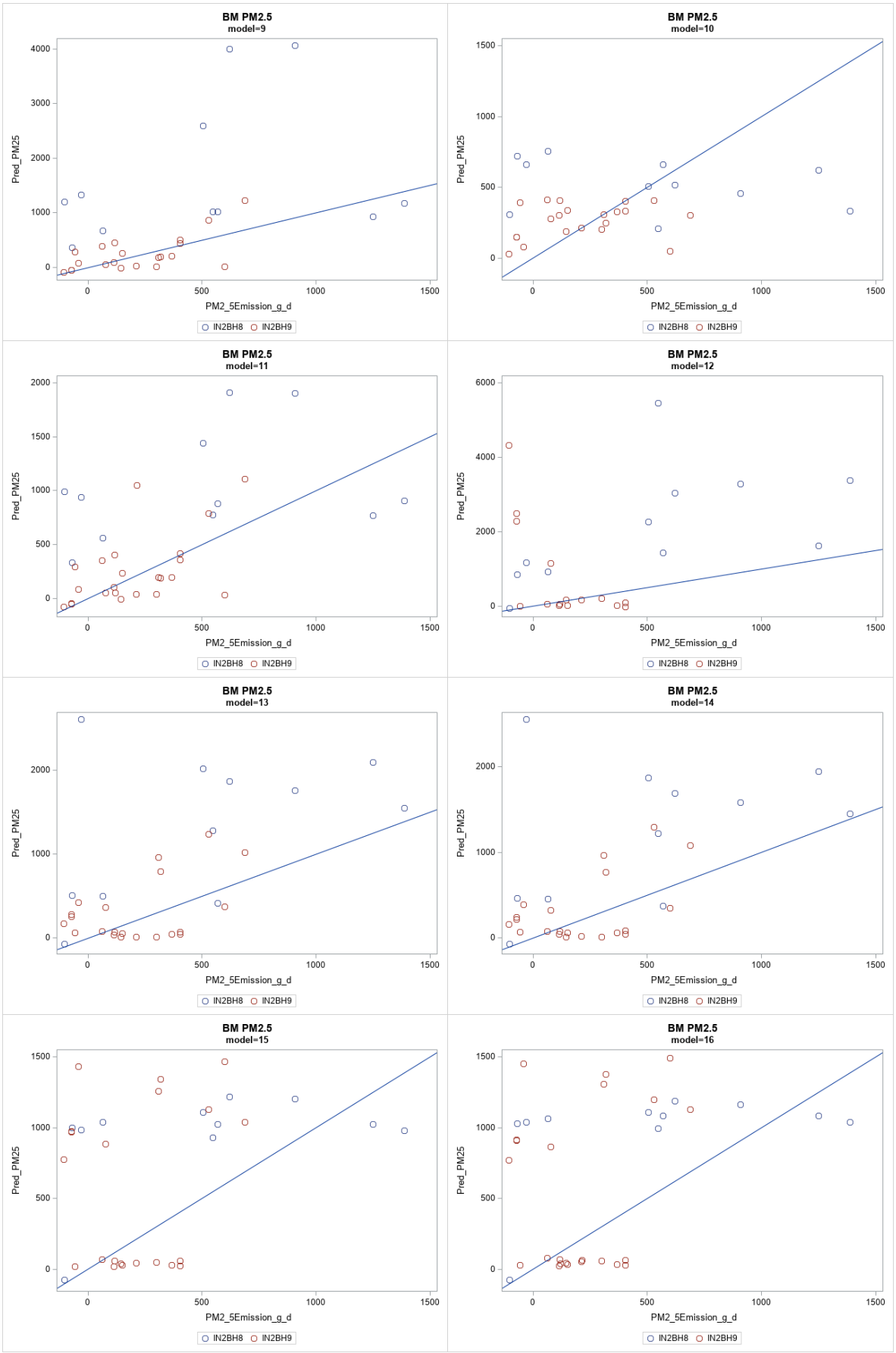

Figure G-18. Manure belt house $PM_{2.5}$ one-to-one plots models 9 through 16.

Table G-23. Parameter and estimates for manure belt house TSP emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	6.936206	8.87165	**0.4404**
	Inventory	0.00987	0.03594	**0.7855**
P-2	Intercept	5.99155	9.72176	**0.5423**
	Inventory	0.01539	0.0404	**0.706**
	Ambient relative humidity	-0.005782	0.01267	**0.6515**
P-3	Intercept	5.400088	9.93986	**0.5915**
	Inventory	0.014807	0.03983	**0.7129**
	Exhaust relative humidity	0.004945	0.02397	**0.8381**
P-4	Intercept	0.931643	10.4965	**0.9299**
	Inventory	0.032681	0.04235	**0.4466**
	Ambient relative humidity	0.001295	0.01358	**0.9247**
	Ambient temperature	0.02696	0.02172	**0.2243**
P-5	Intercept	-0.557657	10.6841	**0.9588**
	Inventory	0.039052	0.04225	**0.3639**
	Exhaust relative humidity	0.000474	0.0226	**0.9834**
	Ambient temperature	0.026653	0.01919	**0.176**
P-6	Intercept	4.570047	11.8127	**0.7017**
	Inventory	0.018506	0.0432	**0.6716**
	Ambient relative humidity	-0.00509	0.01302	**0.6987**
	Exhaust temperature	0.022693	0.10278	**0.827**
P-7	Intercept	3.270848	11.9588	**0.7867**
	Inventory	0.019968	0.04294	**0.6458**
	Exhaust relative humidity	0.004089	0.0239	**0.8654**
	Exhaust temperature	0.034352	0.10044	**0.7354**
P-8	Intercept	10.02535	5.38972	**0.0744**
	Live animal weight	-0.003082	0.01507	**0.8398**
	Ambient temperature	0.01859	0.02478	**0.4581**
	Ambient relative humidity	0.003044	0.01382	**0.8271**
P-9	Intercept	9.484187	5.35837	**0.0889**
	Live animal weight	-0.000969	0.01539	**0.9503**
	Ambient temperature	0.017318	0.02344	**0.465**
	Exhaust relative humidity	0.000939	0.02389	**0.9689**
P-10	Intercept	12.886557	5.97738	*0.0414*
	Live animal weight	-0.009111	0.01332	**0.5007**
	Exhaust temperature	-0.010104	0.10065	**0.9207**
	Ambient relative humidity	-0.00111	0.01328	**0.9339**
P-11	Intercept	11.921498	5.94847	**0.0558**
	Live animal weight	-0.008098	0.01283	**0.5329**
	Exhaust temperature	-0.004938	0.10048	**0.9611**
	Exhaust relative humidity	0.006196	0.02451	**0.8022**
P-12	Intercept	26.866895	13.2367	**0.0528**
	Hen age	-0.003326	0.0014	*0.0262*

Model	Parameter	Estimate	Standard Error	p-value
	Inventory	-0.066133	0.05325	**0.2254**
	Ambient relative humidity	-0.004948	0.01273	**0.7002**
P-13	Intercept	5.178835	9.95086	**0.6065**
	F	0.351267	0.93894	**0.7148**
	M	0	.	.
	Inventory	0.017207	0.04058	**0.6746**
	Ambient relative humidity	-0.005463	0.01268	**0.6696**
P-14	Intercept	0.033107	10.7166	**0.9976**
	F	0.397099	0.97067	**0.6898**
	M	0	.	.
	Inventory	0.034641	0.04251	**0.4217**
	Ambient temperature	0.027125	0.02169	**0.221**
	Ambient relative humidity	0.001645	0.01358	**0.9044**
P-15	Intercept	0.948768	9.75704	**0.9232**
	Inventory	0.033059	0.03914	**0.4051**
	Ambient temperature	0.025805	0.01899	**0.1847**
P-16	Intercept	4.719899	10.9951	**0.6709**
	Inventory	0.015134	0.03922	**0.7024**
	Exhaust temperature	0.034521	0.09845	**0.7286**

Table G-24. Fit and evaluation statistics for the manure belt house TSP models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
P-1	238	250	252	243	0.074	9.95	78.29	11,670	82.75	0.555
P-2	233	247	249	238	0.085	10.020	78.37	11,760	-41.4	-0.276
P-3	232	246	248	237	0.12	10.07	78.03	11,800	-5.875	-0.039
P-4	232	248	250	237	0.041	10.09	76.75	11,520	-241.80	-1.612
P-5	230	246	249	236	0.056	10.1	75.66	11,450	-239	-1.580
P-6	233	249	252	239	0.068	10.06	78.53	11,780	-93.59	-0.624
P-7	232	248	251	238	0.088	10.08	78.22	11,830	-98.2	-0.649
P-8	232	248	251	238	-0.02	10.02	76.68	11,500	-180	-1.199
P-9	231	247	250	237	-0.017	10.01	75.92	11,490	-270.6	-1.789
P-10	233	249	251	238	0.008	10.090	80.19	12,030	120.4	0.803
P-11	232	248	250	237	0.024	10.1	78.76	11,910	-31.93	-0.211
P-12	226	242	245	232	0.32	10.04	68.49	10,370	-191.3	-1.264
P-13	233	249	252	239	0.07	9.979	77.61	11,640	-113.2	-0.76
P-14	231	249	253	238	0.043	9.936	75.66	11,350	-323.2	-2.154
P-15	237	251	252	241	0.044	9.941	75.94	11,320	-205.4	-1.378
P-16	238	252	254	243	0.043	9.958	78.36	11,680	-17.93	-0.12

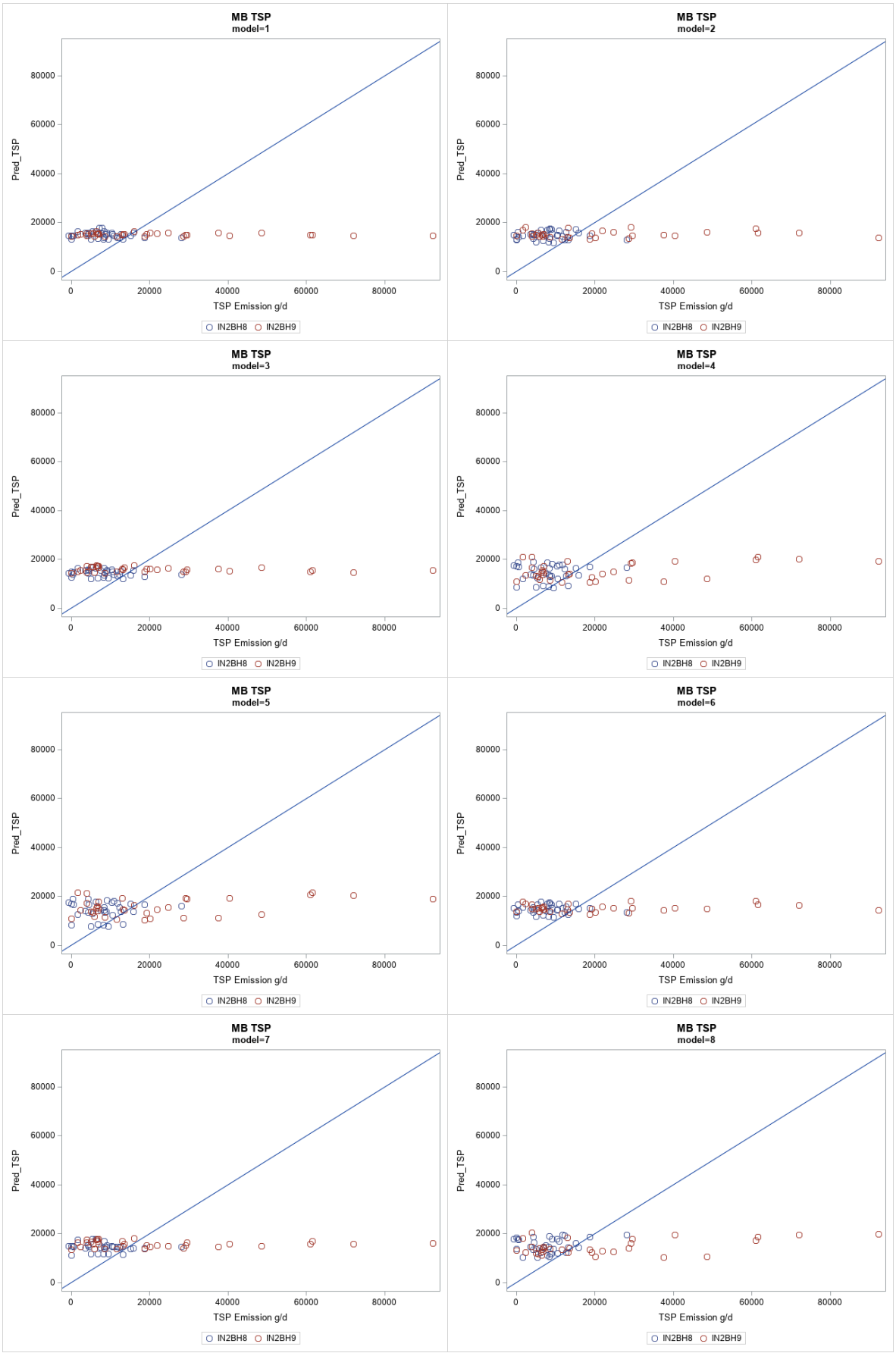

Figure G-19. Manure belt house TSP one-to-one plots models 1 through 8.

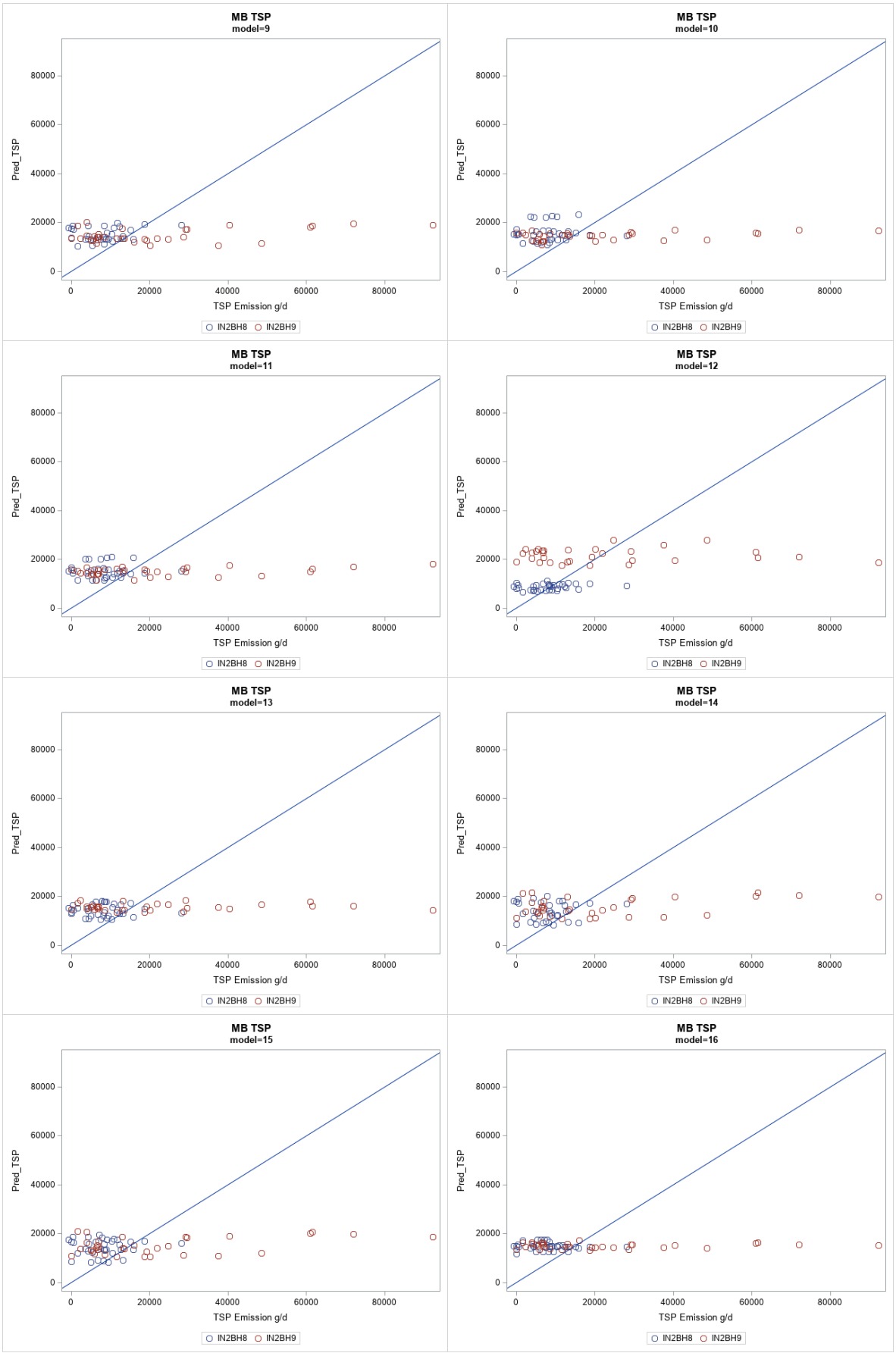

Figure G-20. Manure belt house TSP one-to-one plots models 9 through 16.

Table G-25. Parameter combinations tested as models for layer manure shed NH_3 and H_2S emissions.

Model	Parameter
G-1	Intercept, Inventory, Ambient temperature
G-2	Intercept, Inventory (5 day lag), Ambient temperature
G-3	Intercept, Live animal weight, Ambient temperature
G-4	Intercept, Live animal weight (5 day lag), Ambient temperature
G-5	Intercept, Inventory (5 day lag), Ambient temperature, Ambient relative humidity
G-6	Intercept, Inventory (5 day lag), Ambient temperature, Wind speed
G-7	Intercept, Inventory (5 day lag), Ambient temperature, Ambient relative humidity, Wind speed
G-8	Intercept, Inventory (5 day lag), Ambient temperature, Average hen age
G-9	Intercept, Inventory (5 day lag), Ambient temperature, Management phase ((CFF), (FE), (FF), (FM), (FT), and (MF))
G-10	Intercept, Inventory (5 day lag), Ambient temperature, Manure age
G-11	Intercept, Inventory (5 day lag), Wind speed
G-12	Intercept, Inventory (5 day lag), Manure age
G-13	Intercept, Inventory (5 day lag), Wind speed, Manure age
G-14	Intercept, Inventory (5 day lag), Ambient relative humidity, Manure age
G-15	Intercept, Inventory (5 day lag), Airflow
G-16	Intercept, Ambient temperature, Airflow
G-17	Intercept, Airflow, manure age
G-18	Intercept, Inventory (5 day lag), Manure age, Management phase (CFF, FE, FF, FM, FT, and MF)
G-19	Intercept, Ambient Temperature, Manure age, Management phase (CFF, FE, FF, FM, FT, and MF)
G-20	Intercept, Inventory (5 day lag)

Table G-26. Parameter combinations tested as models for layer manure shed PM_{10}, $PM_{2.5}$, and TSP emissions.

Model	Parameter
P-1	Intercept, Inventory, Airflow
P-2	Intercept, Inventory (5 day lag), Airflow
P-3	Intercept, Live animal weight, Airflow
P-4	Intercept, Live animal weight (5 day lag), Airflow
P-5	Intercept, Inventory (5 day lag), Wind speed
P-6	Intercept, Inventory (5 day lag), Ambient temperature
P-7	Intercept, Inventory (5 day lag), Ambient relative humidity
P-8	Intercept, Inventory (5 day lag), Average hen age
P-9	Intercept, Inventory (5 day lag), Management phase (CFF, FE, FF, FM, FT, and MF)
P-10	Intercept, Inventory (5 day lag), Manure age
P-11	Intercept, Inventory (5 day lag),
P-12	Intercept, Live animal weight (5 day lag)
P-13	Intercept, Airflow

Table G-27. Parameter and estimates for layer manure shed NH_3 emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
G-1	Intercept	-0.093535	0.53554	**0.8615**
	Inventory	0.003706	0.00109	0.0008
	Ambient Temperature	-0.013247	0.00385	0.0007
G-2	Intercept	-0.194945	0.5268	**0.7116**
	Inventory (5 day lag)	0.003927	0.00108	0.0003
	Ambient Temperature	-0.013752	0.00385	0.0004
G-3	Intercept	0.77162	0.72672	**0.2893**
	Live animal weight	0.001413	0.00106	**0.1819**
	Ambient Temperature	-0.014411	0.00393	0.0003
G-4	Intercept	1.607649	0.72587	*0.0276*
	Live animal weight (5 day lag)	0.000211	0.00105	**0.8415**
	Ambient Temperature	-0.014591	0.00396	0.0003
G-5	Intercept	-0.200801	0.5544	**0.7175**
	Inventory (5 day lag)	0.003926	0.00108	0.0003
	Ambient Temperature	-0.013697	0.00417	0.0011
	Ambient relative humidity	0.000087	0.00257	**0.973**
G-6	Intercept	-0.204953	0.52685	**0.6976**
	Inventory (5 day lag)	0.003998	0.00108	0.0003
	Ambient Temperature	-0.014176	0.00389	0.0003
	Wind speed	-0.028035	0.03929	**0.4759**
G-7	Intercept	-0.234691	0.55617	**0.6733**
	Inventory (5 day lag)	0.003993	0.00108	0.0003
	Ambient Temperature	-0.013919	0.00418	0.001
	Wind speed	-0.029245	0.03996	**0.4646**
	Ambient relative humidity	0.000435	0.00261	**0.8677**
G-8	Intercept	-2.184307	2.10806	**0.3013**
	Inventory (5 day lag)	0.008211	0.0041	*0.0465*
	Ambient Temperature	-0.01487	0.00431	0.0007
	Average hen age	0.000045	0.00046	**0.9215**
G-9	Intercept	1.365736	0.92967	**0.1426**
	CFF	-1.127859	0.45398	*0.0134*
	FE	-1.085898	0.61032	**0.0759**
	FF	-0.761009	0.19641	0.0001
	FM	-0.21515	0.25873	**0.4063**
	FT	-1.19297	0.364	0.0011
	MF	0	.	.
	Inventory (5 day lag)	0.001975	0.00183	**0.2807**
	Ambient Temperature	-0.005749	0.00421	**0.173**
G-10	Intercept	-0.502174	0.52469	**0.3394**
	Inventory (5 day lag)	0.003861	0.00106	0.0003
	Ambient Temperature	-0.007305	0.00414	**0.0786**
	Manure age	0.001224	0.00032	0.0001
G-11	Intercept	-0.353768	0.54826	**0.5193**
	Inventory (5 day lag)	0.003864	0.00113	0.0007
	Wind speed	-0.009488	0.0388	**0.8069**

Model	Parameter	Estimate	Standard Error	p-value
G-12	Intercept	-0.619946	0.53464	**0.2472**
	Inventory (5 day lag)	0.003821	0.00109	0.0005
	Manure age	0.001395	0.00029	<.0001
G-13	Intercept	-0.645153	0.52975	**0.2243**
	Inventory (5 day lag)	0.003875	0.00108	0.0004
	Manure age	0.001469	0.0003	<.0001
	Wind speed	-0.026953	0.03834	**0.4825**
G-14	Intercept	-0.789483	0.54424	**0.1479**
	Inventory (5 day lag)	0.003771	0.00107	0.0005
	Manure age	0.001434	0.00029	<.0001
	Ambient relative humidity	0.00275	0.00234	**0.2414**
G-15	Intercept	-0.383165	0.47248	**0.418**
	Airflow	0.025665	0.00166	<.0001
	Inventory (5 day lag)	0.003203	0.00097	0.0011
G-16	Intercept	1.35475	0.06234	<.0001
	Airflow	0.026011	0.00172	<.0001
	Ambient Temperature	-0.013239	0.00335	<.0001
G-17	Intercept	0.930519	0.06529	<.0001
	Airflow	0.025631	0.00166	<.0001
	Manure age	0.001198	0.00026	<.0001
G-18	Intercept	1.10654	0.91811	**0.2288**
	CFF	-0.677203	0.45526	**0.1377**
	FE	-1.109011	0.60165	**0.0659**
	FF	-0.650149	0.18947	0.0007
	FM	-0.004042	0.2595	**0.9876**
	FT	-1.164419	0.35849	0.0013
	MF	0	.	.
	Inventory (5 day lag)	0.001621	0.00181	**0.3712**
	Manure age	0.001206	0.00029	<.0001
G-19	Intercept	1.889412	0.21118	<.0001
	CFF	-0.759612	0.45799	**0.098**
	FE	-1.43337	0.48585	0.0033
	FF	-0.659925	0.1943	0.0008
	FM	-0.05961	0.25373	**0.8144**
	FT	-1.390809	0.25771	<.0001
	MF	0	.	.
	Manure age	0.001276	0.00032	<.0001
	Ambient Temperature	0.000626	0.00446	**0.8883**
G-20	Intercept	-0.365539	0.55253	**0.5087**
	Inventory (5 day lag)	0.003885	0.00113	0.0007

Table G-28. Fit and evaluation statistics for the layer manure shed NH_3 models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (kg day^{-1})	MB[b] (kg day^{-1})	NMB[b] (%)
G-1	765	775	775	796	0.361	32.65	72.64	3.45	-0.084	-1.763
G-2	763	773	773	794	0.367	32.47	72.45	3.442	-0.086	-1.814
G-3	745	755	755	776	0.335	32.2	72.32	3.542	-0.063	-1.28
G-4	746	756	756	777	0.334	32.38	72.81	3.567	-0.051	-1.035
G-5	763	775	775	800	0.367	32.47	72.47	3.442	-0.086	-1.813
G-6	763	775	775	800	0.366	32.49	72.44	3.441	-0.086	-1.803
G-7	763	777	777	806	0.365	32.490	72.48	3.443	-0.086	-1.801
G-8	502	514	514	537	0.394	28.48	65	3.429	-0.098	-1.855
G-9	739	759	759	801	0.411	31.81	71.52	3.397	-0.027	-0.569
G-10	748	760	760	785	0.389	31.69	71.14	3.379	-0.051	-1.07
G-11	774	784	784	805	0.199	34.29	76.34	3.626	-0.033	-0.705
G-12	784	794	794	815	0.326	32.45	72.98	3.462	-0.019	-0.405
G-13	751	763	763	788	0.339	32.37	72.38	3.438	-0.023	-0.482
G-14	750	762	762	787	0.356	32.12	72.15	3.427	-0.036	-0.76
G-15	609	619	620	641	0.551	29.68	60.36	2.863	-0.193	-4.068
G-16	587	597	598	618	0.599	28.47	57.31	2.722	-0.272	-5.725
G-17	599	609	609	630	0.57	29.09	58.01	2.752	-0.235	-4.949
G-18	756	776	776	818	0.439	30.93	69.82	3.312	-0.007	-0.153
G-19	724	744	745	786	0.442	30.93	69.94	3.322	0.006	0.129
G-20	806	814	814	831	0.196	34.11	76.38	3.624	-0.032	-0.665

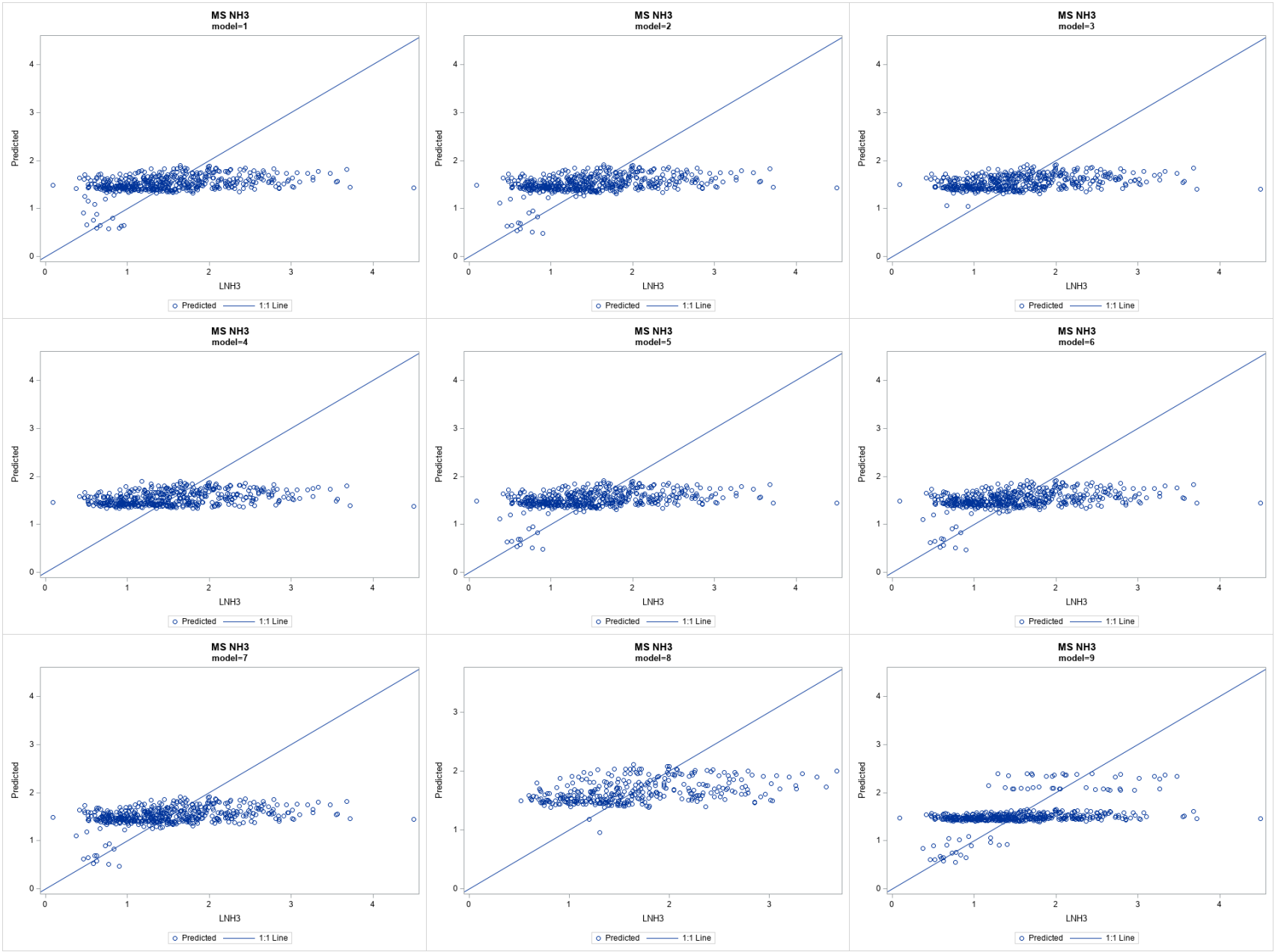

Figure G-21. Layer manure shed NH_3 one-to-one plots models 1 through 9.

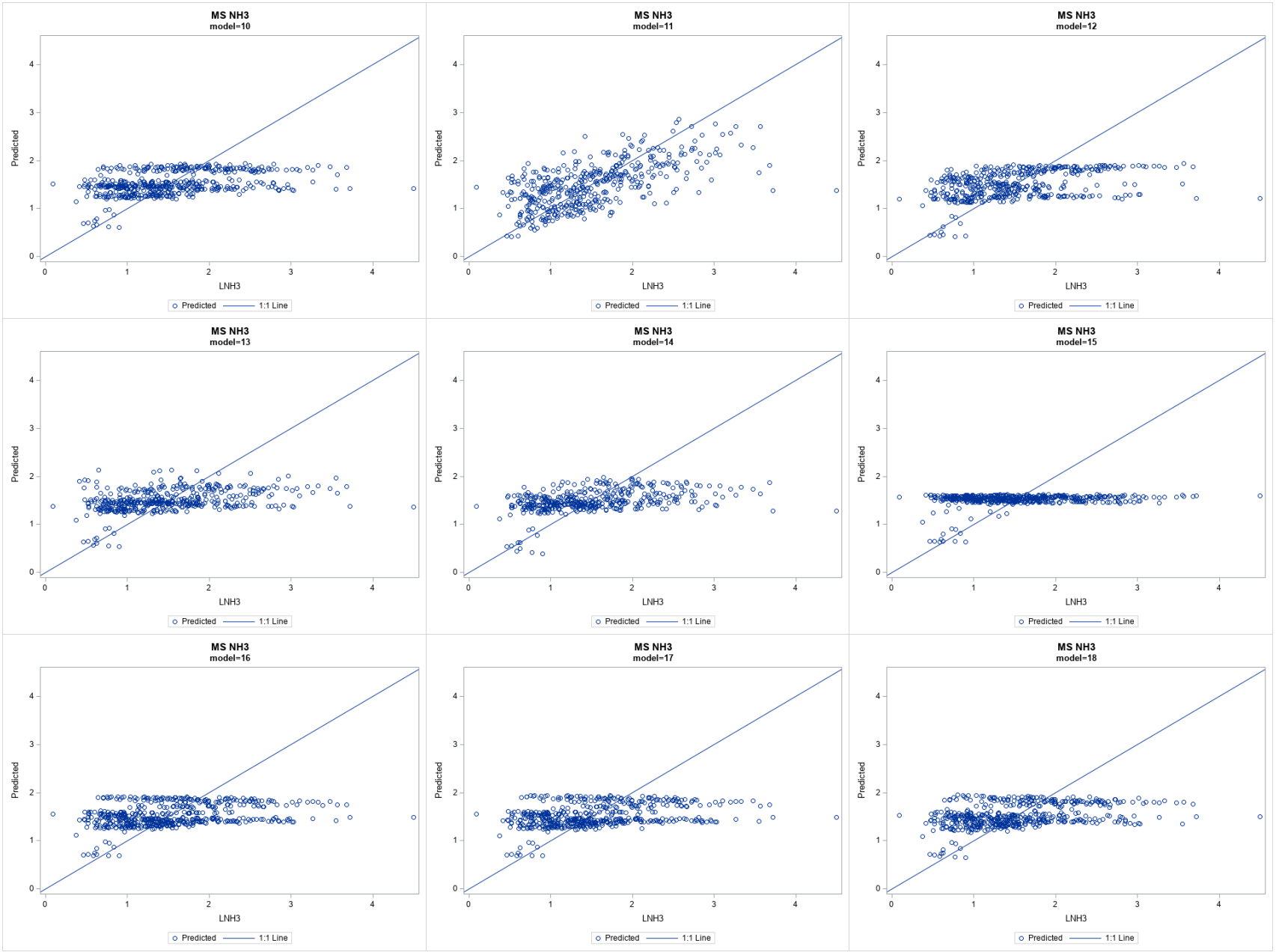

Figure G-22. Layer manure shed NH_3 one-to-one plots models 10 through 18.

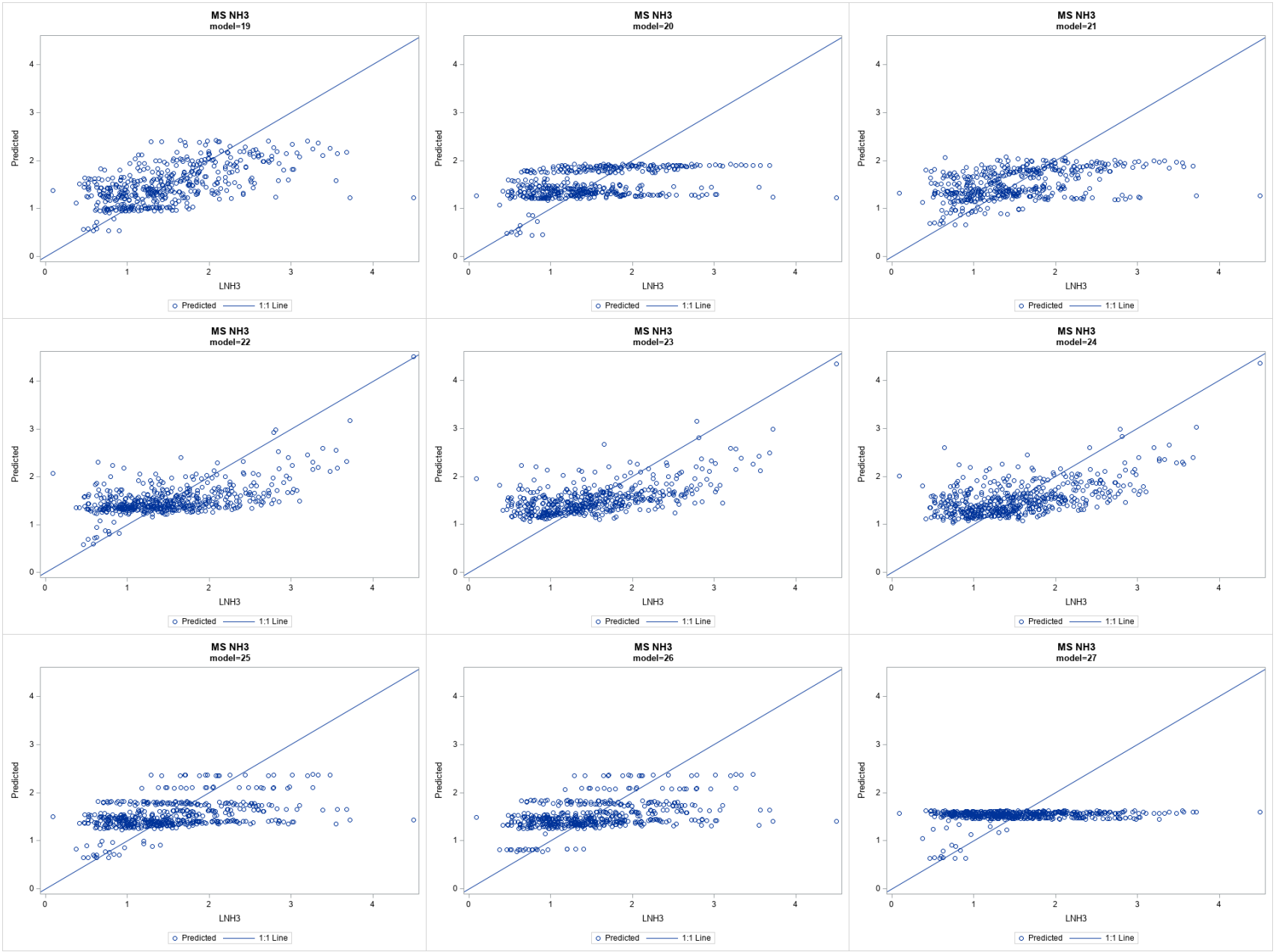

Figure G-23. Layer manure shed NH_3 one-to-one plots models 19 through 27.

Table G-29. Parameter and estimates for layer manure shed H_2S emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
G-1	Intercept	0.755232	0.60942	**0.2163**
	Inventory	0.006078	0.00125	<.0001
	Ambient Temperature	-0.023815	0.00448	<.0001
G-2	Intercept	1.295775	0.60993	*0.0345*
	Inventory (5 day lag)	0.004976	0.00125	<.0001
	Ambient Temperature	-0.024164	0.00454	<.0001
G-3	Intercept	2.764473	0.84436	0.0012
	Live animal weight	0.001413	0.00123	**0.2532**
	Ambient Temperature	-0.023989	0.00471	<.0001
G-4	Intercept	4.186178	0.84953	<.0001
	Live animal weight (5 day lag)	-0.000664	0.00124	**0.5924**
	Ambient Temperature	-0.022925	0.00477	<.0001
G-5	Intercept	1.263787	0.64345	**0.0504**
	Inventory (5 day lag)	0.004968	0.00125	<.0001
	Ambient Temperature	-0.02389	0.00488	<.0001
	Ambient relative humidity	0.000476	0.00305	**0.876**
G-6	Intercept	1.274465	0.61052	*0.0377*
	Inventory (5 day lag)	0.005129	0.00126	<.0001
	Ambient Temperature	-0.025048	0.0046	<.0001
	Wind speed	-0.062217	0.0471	**0.1872**
G-7	Intercept	1.191004	0.6457	**0.0661**
	Inventory (5 day lag)	0.005117	0.00126	<.0001
	Ambient Temperature	-0.024391	0.0049	<.0001
	Wind speed	-0.065576	0.04787	**0.1714**
	Ambient relative humidity	0.001225	0.00309	**0.6922**
G-8	Intercept	2.142455	2.53874	**0.3998**
	Inventory (5 day lag)	0.004477	0.00495	**0.367**
	Ambient Temperature	-0.026488	0.0053	<.0001
	Average hen age	-0.001243	0.00055	*0.0255*
G-9	Intercept	1.95062	1.09308	**0.0751**
	CFF	-1.101759	0.55353	*0.0472*
	FE	-0.65747	0.72742	**0.3665**
	FF	-0.834148	0.23239	0.0004
	FM	-0.101993	0.30247	**0.7362**
	FT	-0.86526	0.43079	*0.0453*
	MF	0	.	.
	Inventory (5 day lag)	0.004885	0.00215	*0.0236*
	Ambient Temperature	-0.01348	0.00509	0.0085
G-10	Intercept	1.137439	0.61664	**0.0661**
	Inventory (5 day lag)	0.004942	0.00125	<.0001
	Ambient Temperature	-0.020719	0.00496	<.0001
	Manure age	0.000624	0.00037	**0.0924**
G-11	Intercept	1.133939	0.6545	**0.0842**
	Inventory (5 day lag)	0.004602	0.00134	0.0007
	Wind speed	-0.032384	0.04695	**0.4907**

Model	Parameter	Estimate	Standard Error	p-value
G-12	Intercept	0.92442	0.64839	**0.1549**
	Inventory (5 day lag)	0.004517	0.00132	0.0007
	Manure age	0.001147	0.00035	0.0012
G-13	Intercept	0.846057	0.64637	**0.1915**
	Inventory (5 day lag)	0.004695	0.00132	0.0004
	Manure age	0.001281	0.00036	0.0004
	Wind speed	-0.046784	0.04675	**0.3175**
G-14	Intercept	0.553938	0.66249	**0.4037**
	Inventory (5 day lag)	0.004553	0.0013	0.0005
	Manure age	0.001229	0.00035	0.0005
	Ambient relative humidity	0.005119	0.00287	**0.0753**
G-15	Intercept	1.108613	0.59271	**0.0623**
	Airflow	0.026849	0.00212	<.0001
	Inventory (5 day lag)	0.003873	0.00122	0.0016
G-16	Intercept	3.321478	0.08027	<.0001
	Airflow	0.02715	0.00218	<.0001
	Ambient Temperature	-0.021926	0.00417	<.0001
G-17	Intercept	2.818123	0.08072	<.0001
	Airflow	0.026809	0.00213	<.0001
	Manure age	0.000895	0.00033	0.0063
G-18	Intercept	1.8084	1.10569	**0.1027**
	CFF	-0.830047	0.55418	**0.1349**
	FE	-0.863555	0.72612	**0.2349**
	FF	-0.925039	0.22826	<.0001
	FM	0.066221	0.31199	**0.832**
	FT	-0.972908	0.43179	*0.0248*
	MF	0	.	.
	Inventory (5 day lag)	0.004587	0.00218	*0.0356*
	Manure age	0.000805	0.00035	*0.0211*
G-19	Intercept	4.145601	0.25269	<.0001
	CFF	-0.940113	0.56368	**0.0961**
	FE	-1.621421	0.58794	0.0061
	FF	-0.810388	0.23545	0.0007
	FM	-0.13455	0.30412	**0.6585**
	FT	-1.514196	0.30967	<.0001
	MF	0	.	.
	Manure age	0.00067	0.00038	**0.0758**
	Ambient Temperature	-0.009705	0.00551	**0.0789**
G-20	Intercept	1.170893	0.65633	**0.0754**
	Inventory (5 day lag)	0.004474	0.00135	0.001

Table G-30. Fit and evaluation statistics for the layer manure shed H_2S models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
G-1	956	966	966	987	0.444	16.93	73.49	26.28	-1.4	-3.915
G-2	963	973	973	994	0.423	17.04	73.72	26.36	-1.37	-3.829
G-3	928	938	939	959	0.386	17.02	74.49	27.39	-1.041	-2.831
G-4	933	943	944	964	0.377	17.28	74.84	27.46	-0.999	-2.723
G-5	963	975	975	1001	0.423	17.04	73.75	26.38	-1.377	-3.849
G-6	962	974	974	999	0.42	17.08	73.73	26.37	-1.348	-3.768
G-7	961	975	976	1005	0.42	17.090	73.79	26.39	-1.366	-3.82
G-8	614	626	627	649	0.495	15.92	67.6	27.84	-1.576	-3.827
G-9	943	963	964	1006	0.451	16.82	73.52	26.29	-0.537	-1.502
G-10	960	972	973	998	0.418	16.99	73.50	26.29	-1.297	-3.627
G-11	988	998	998	1019	0.184	18.7	82.25	29.42	-0.264	-0.737
G-12	1015	1025	1025	1046	0.258	18.07	79.97	28.76	-0.515	-1.432
G-13	975	987	987	1012	0.264	18.07	78.66	28.13	-0.536	-1.499
G-14	973	985	985	1010	0.31	17.8	77.34	27.66	-0.884	-2.471
G-15	886	896	896	917	0.479	16.35	67.59	24.31	-1.73	-4.811
G-16	843	853	853	874	0.566	15.45	59.89	21.42	-2.664	-7.449
G-17	888	898	899	920	0.47	16.46	66.01	23.74	-2.125	-5.908
G-18	981	1001	1001	1043	0.417	17.05	75.06	26.99	-0.442	-1.229
G-19	945	965	966	1008	0.434	16.93	74.08	26.49	-0.186	-0.52
G-20	1025	1033	1033	1051	0.187	18.67	83.12	29.89	-0.238	-0.661

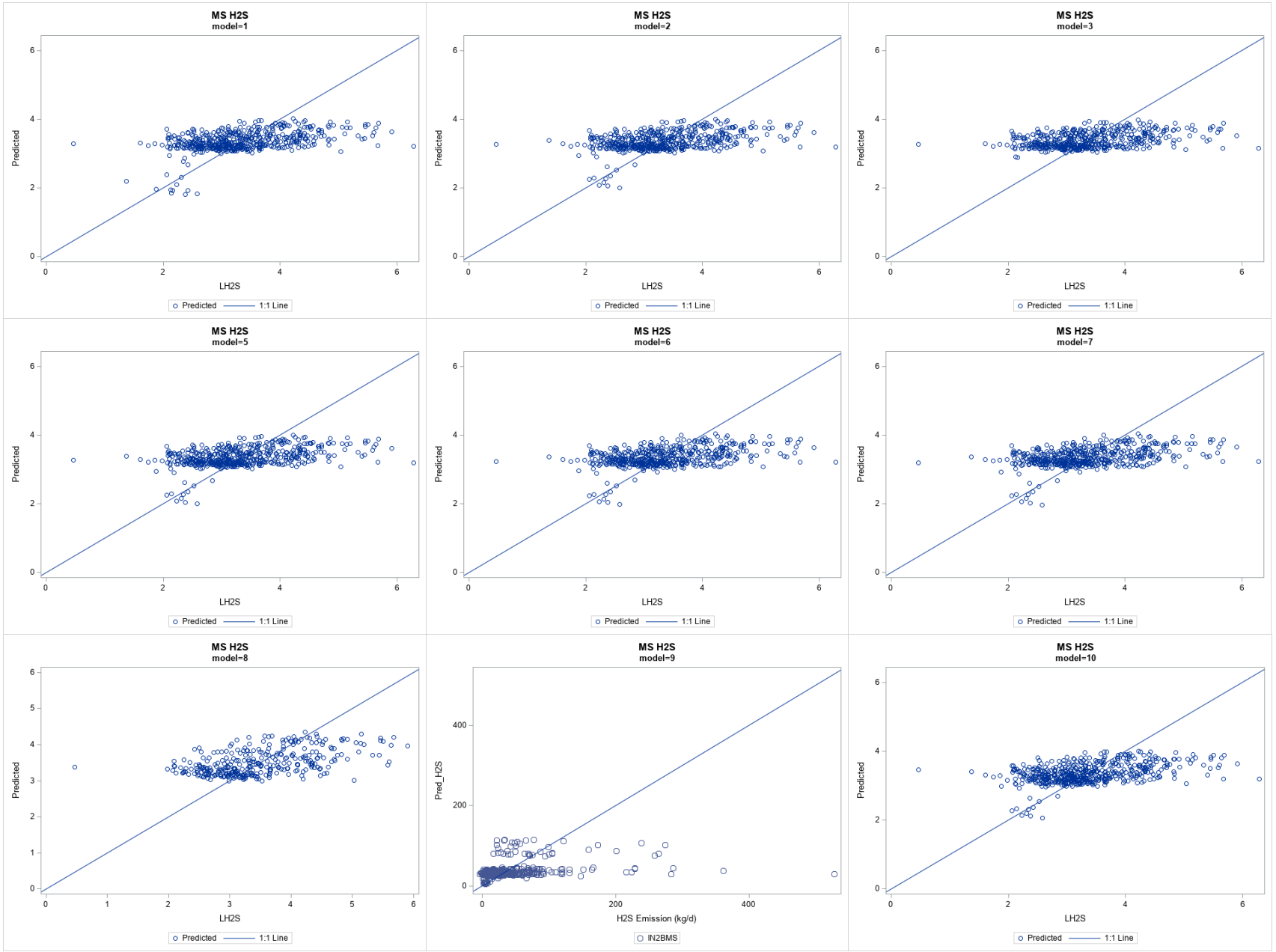

Figure G-24. Layer manure shed H_2S one-to-one plots models 1 through 10.

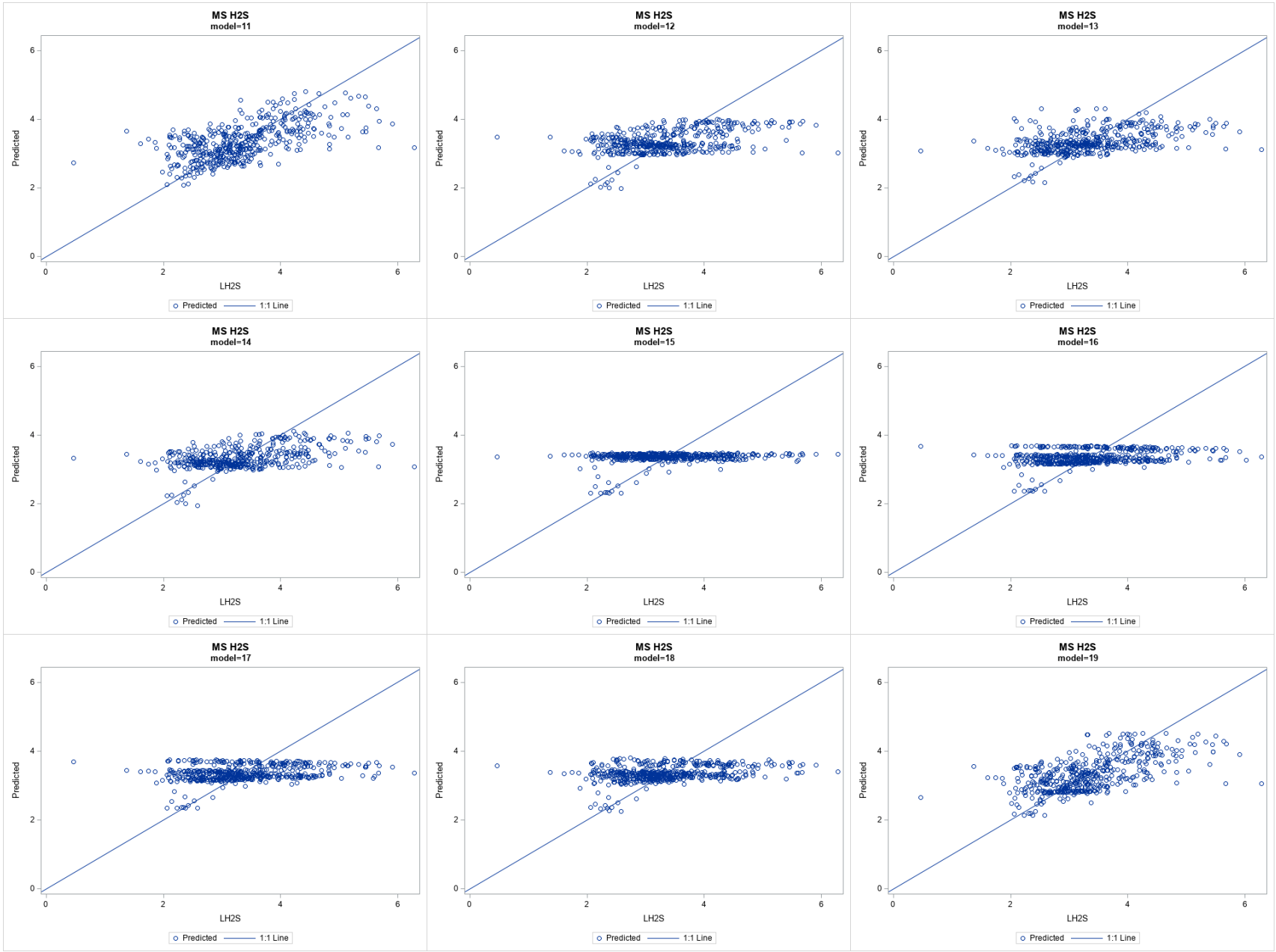

Figure G-25. Layer manure shed H_2S one-to-one plots models 11 through 19.

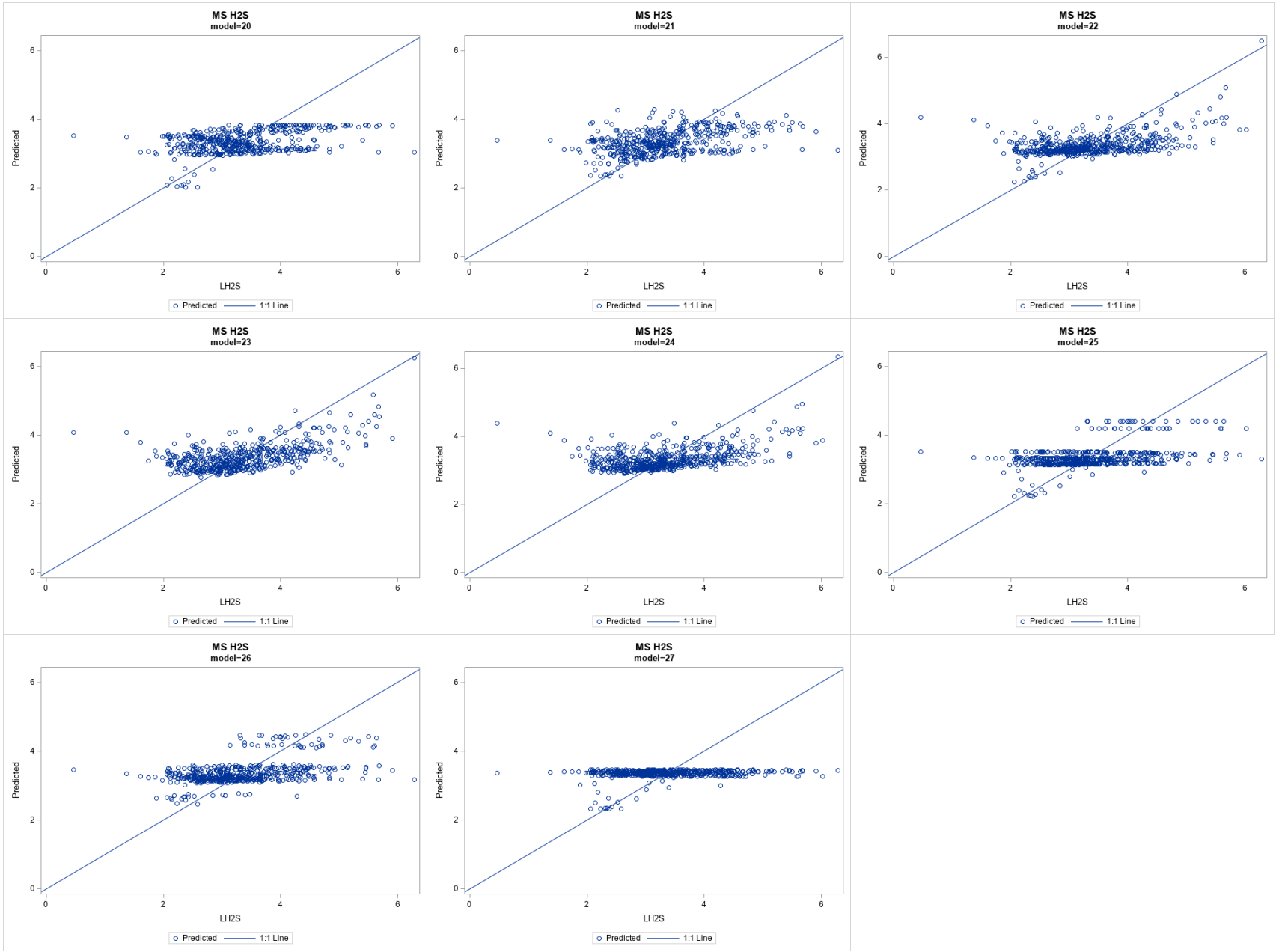

Figure G-26. Layer manure shed H_2S one-to-one plots models 20 through 27.

Table G-31. Parameter and estimates for layer manure shed PM_{10} emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	4.069675	1.25809	0.0015
	Inventory	0.000441	0.00258	**0.8643**
	Airflow	0.050735	0.0077	<.0001
P-2	Intercept	4.530912	1.13681	0.0001
	Inventory (5 day lag)	-0.000509	0.00233	**0.8273**
	Airflow	0.050994	0.00771	<.0001
P-3	Intercept	0.71194	1.69773	**0.6757**
	Live animal weight	0.005127	0.00244	*0.0376*
	Airflow	0.048737	0.00777	<.0001
P-4	Intercept	0.230996	1.75607	**0.8956**
	Live animal weight (5 day lag)	0.005803	0.00252	*0.0228*
	Airflow	0.049074	0.00773	<.0001
P-5	Intercept	4.617304	1.3095	0.0006
	Inventory (5 day lag)	0.000414	0.00269	**0.8779**
	Wind speed	0.113139	0.11575	**0.3292**
P-6	Intercept	4.557673	1.31245	0.0007
	Inventory (5 day lag)	0.000511	0.00271	**0.8504**
	Ambient Temperature	0.005383	0.00907	**0.5535**
P-7	Intercept	5.242112	1.41299	0.0003
	Inventory (5 day lag)	0.00035	0.0027	**0.8968**
	Ambient relative humidity	-0.007909	0.00589	**0.1804**
P-8	Intercept	-66.36761	74.762	**0.377**
	Inventory (5 day lag)	0.134653	0.14143	**0.3435**
	Average hen age	0.01381	0.01456	**0.3454**
P-9	Intercept	4.161863	1.6264	*0.0116*
	FF	-0.807121	1.09202	**0.4608**
	FM	-1.766058	1.09532	**0.1087**
	FT	0	.	.
	Inventory (5 day lag)	0.003175	0.00496	**0.523**
P-10	Intercept	4.343148	1.30873	0.0011
	Inventory (5 day lag)	0.000766	0.00266	**0.774**
	Manure age	0.000939	0.00057	**0.0993**
P-11	Intercept	4.5366	1.31267	0.0007
	Inventory (5 day lag)	0.000732	0.00268	**0.7853**
P-12	Intercept	-0.684347	2.01647	**0.7349**
	Live animal weight (5 day lag)	0.007952	0.00287	0.0065
P-13	Intercept	4.283943	0.11276	<.0001
	Airflow	0.050837	0.00768	<.0001

Table G-32. Fit and evaluation statistics for the layer manure shed PM_{10} models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
P-1	737	747	747	765	0.409	15.22	85.51	147	-9.075	-5.279
P-2	737	747	747	765	0.41	15.2	85.43	146.9	-9.1	-5.294
P-3	725	735	735	752	0.429	15.15	86.01	148.5	-6.199	-3.59
P-4	724	734	734	752	0.433	15.1	86.13	148.7	-5.675	-3.287
P-5	774	784	784	802	0.077	16.43	104.7	180	0.623	0.362
P-6	774	784	785	802	0.036	16.41	103	177.1	-0.928	-0.54
P-7	773	783	783	801	0.071	16.48	102.8	176.8	-1.222	-0.711
P-8	507	517	518	533	0.067	16.68	104.7	154.7	-1.623	-1.098
P-9	770	782	782	803	0.156	16.29	102.9	176.9	-0.996	-0.579
P-10	772	782	782	800	0.105	16.47	105.2	180.8	2.566	1.493
P-11	775	783	783	797	0.021	16.48	104	178.8	-0.291	-0.169
P-12	759	767	767	782	0.193	16.45	103.6	178.9	0.766	0.443
P-13	737	745	745	759	0.409	15.22	85.49	147	-9.1	-5.294

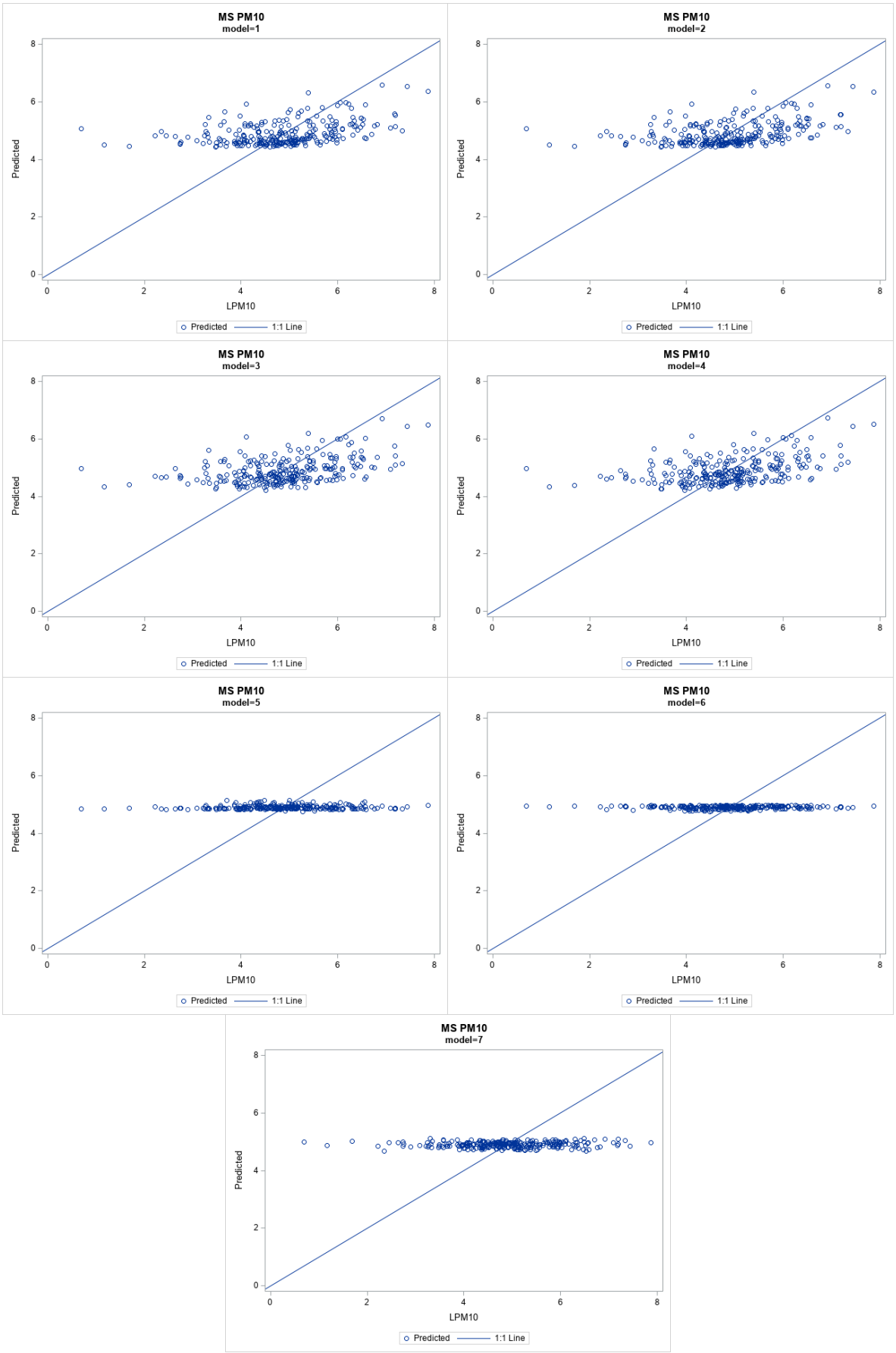

Figure G-27. Layer manure shed PM_{10} one-to-one plots models 1 through 7.

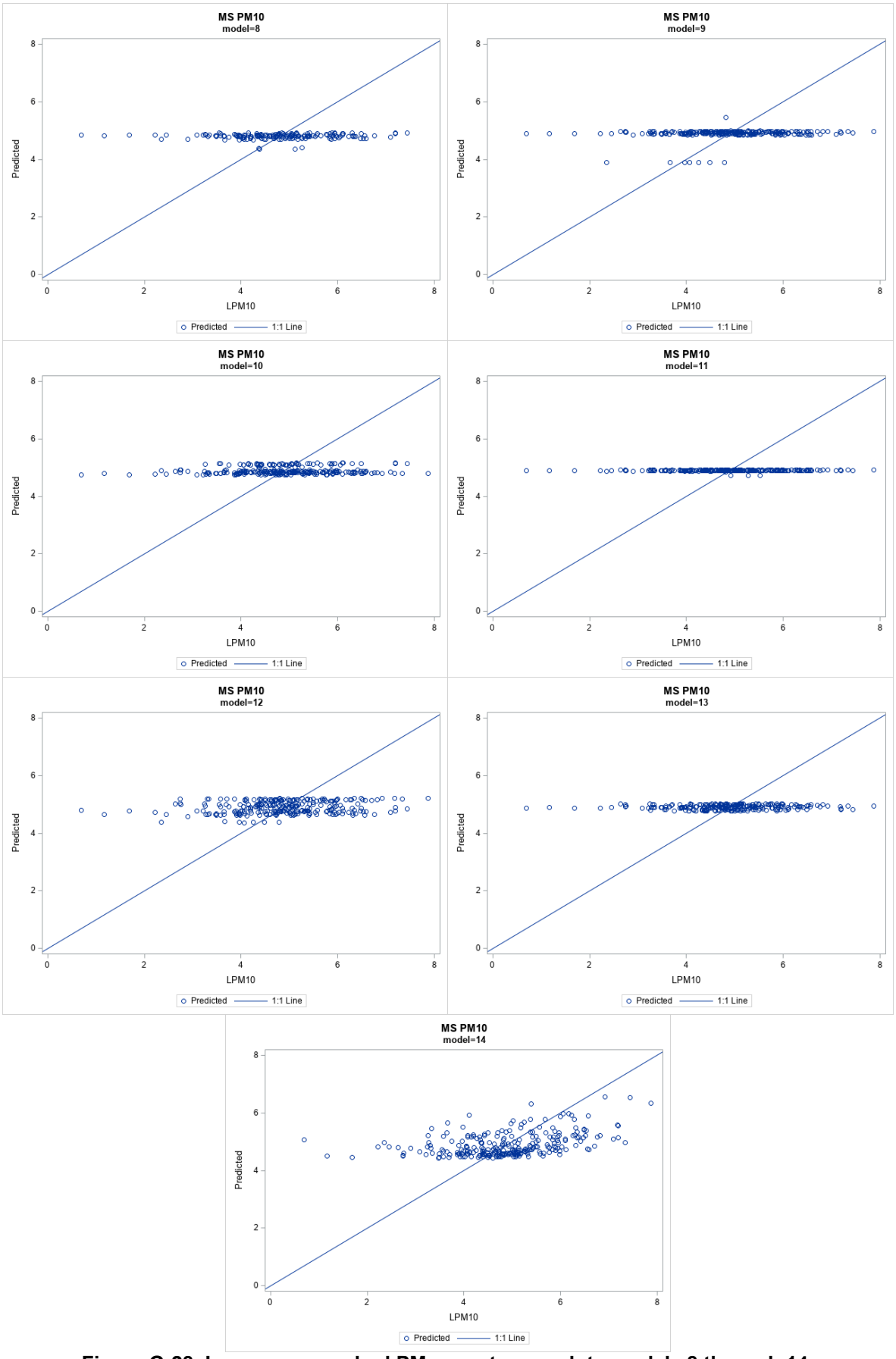

Figure G-28. Layer manure shed PM_{10} one-to-one plots models 8 through 14.

Table G-33. Parameter and estimates for layer manure shed $PM_{2.5}$ emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	-14.84682	8.72133	**0.1062**
	Inventory	0.033562	0.01766	**0.0736**
	Airflow	0.067728	0.00999	<.0001
P-2	Intercept	-14.83081	8.79651	**0.1094**
	Inventory (5 day lag)	0.033497	0.01779	**0.0762**
	Airflow	0.067819	0.00999	<.0001
P-3	Intercept	-4.34117	4.60554	**0.359**
	Live animal weight	0.008795	0.00666	**0.2036**
	Airflow	0.070025	0.01008	<.0001
P-4	Intercept	-2.158197	4.1939	**0.6134**
	Live animal weight (5 day lag)	0.005665	0.00608	**0.3646**
	Airflow	0.070835	0.01017	<.0001
P-5	Intercept	-31.51962	15.7683	**0.0601**
	Inventory (5 day lag)	0.069985	0.03188	*0.0407*
	Wind speed	-0.312909	0.43464	**0.4776**
P-6	Intercept	-23.98923	17.8262	**0.195**
	Inventory (5 day lag)	0.054672	0.03552	**0.141**
	Ambient Temperature	-0.008898	0.02378	**0.7126**
P-7	Intercept	-27.46865	13.9511	**0.0645**
	Inventory (5 day lag)	0.064388	0.02812	*0.0344*
	Ambient relative humidity	-0.022083	0.01865	**0.2484**
P-8	Intercept	490.18321	895.044	**0.589**
	Inventory (5 day lag)	-0.922294	1.70959	**0.5945**
	Average hen age	-0.094642	0.15137	**0.5377**
P-9	Intercept	-26.39053	13.6003	**0.0686**
	FF	-0.906908	0.48512	**0.0788**
	MF	0	.	.
	Inventory (5 day lag)	0.060338	0.02726	*0.0404*
P-10	Intercept	-24.92318	13.6853	**0.0857**
	Inventory (5 day lag)	0.055385	0.02762	**0.0606**
	Manure age	0.002715	0.00142	**0.0719**
P-11	Intercept	-30.57734	14.5816	**0.0505**
	Inventory (5 day lag)	0.067599	0.02933	*0.0334*
P-12	Intercept	-5.178811	7.38577	**0.4919**
	Live animal weight (5 day lag)	0.011848	0.01065	**0.2802**
P-13	Intercept	1.747983	0.24149	<.0001
	Airflow	0.071834	0.01021	<.0001

Table G-34. Fit and evaluation statistics for the layer manure shed $PM_{2.5}$ models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (g day^{-1})	MB[b] (g day^{-1})	NMB[b] (%)
P-1	57	67	69	74	0.851	16.37	26.54	12.81	1.882	3.9
P-2	57	67	70	74	0.85	16.41	26.63	12.85	1.881	3.897
P-3	59	69	71	76	0.84	17.31	28.47	13.74	1.34	2.776
P-4	59	69	72	77	0.834	17.46	27.06	13.06	0.43	0.892
P-5	81	91	94	98	0.411	29.46	76.99	39.49	-6.222	-12.13
P-6	81	91	94	98	0.423	29.35	80.79	41.43	-6.569	-12.81
P-7	80	90	93	97	0.482	27.94	65.18	33.43	-4.768	-9.297
P-8	51	59	61	64	0.719	21.17	54.34	16.17	-0.486	-1.634
P-9	84	94	96	101	0.563	27.89	78.72	38	-4.163	-8.626
P-10	84	94	96	101	0.567	27.8	78.66	37.97	-4.023	-8.336
P-11	87	95	96	101	0.452	30.33	79.34	38.29	-6.885	-14.27
P-12	90	98	100	104	0.24	33.6	91.71	44.26	-5.069	-10.5
P-14	60	68	70	74	0.826	16.62	31.96	15.42	-0.695	-1.44

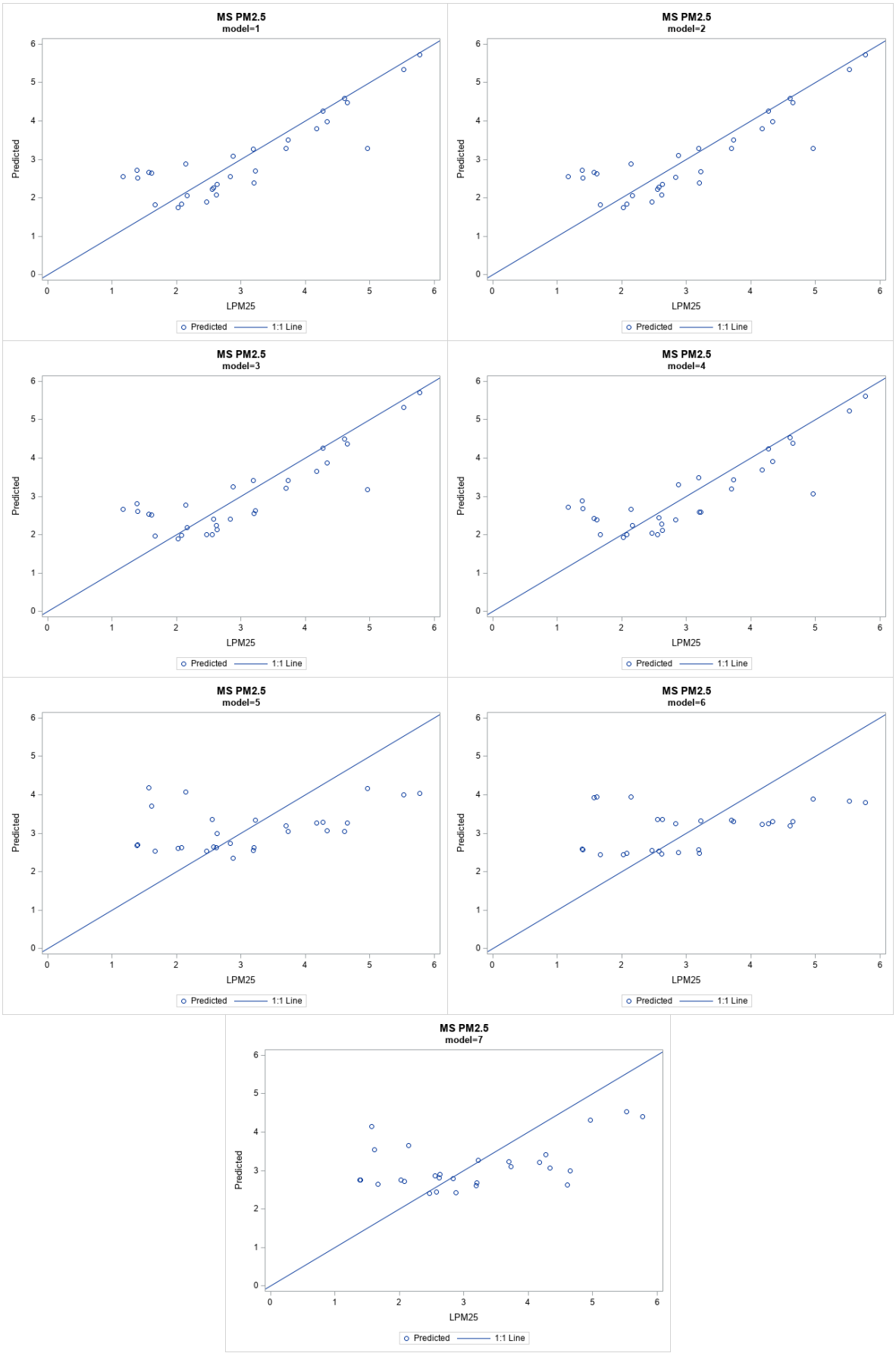

Figure G-29. Layer manure shed $PM_{2.5}$ one-to-one plots models 1 through 7.

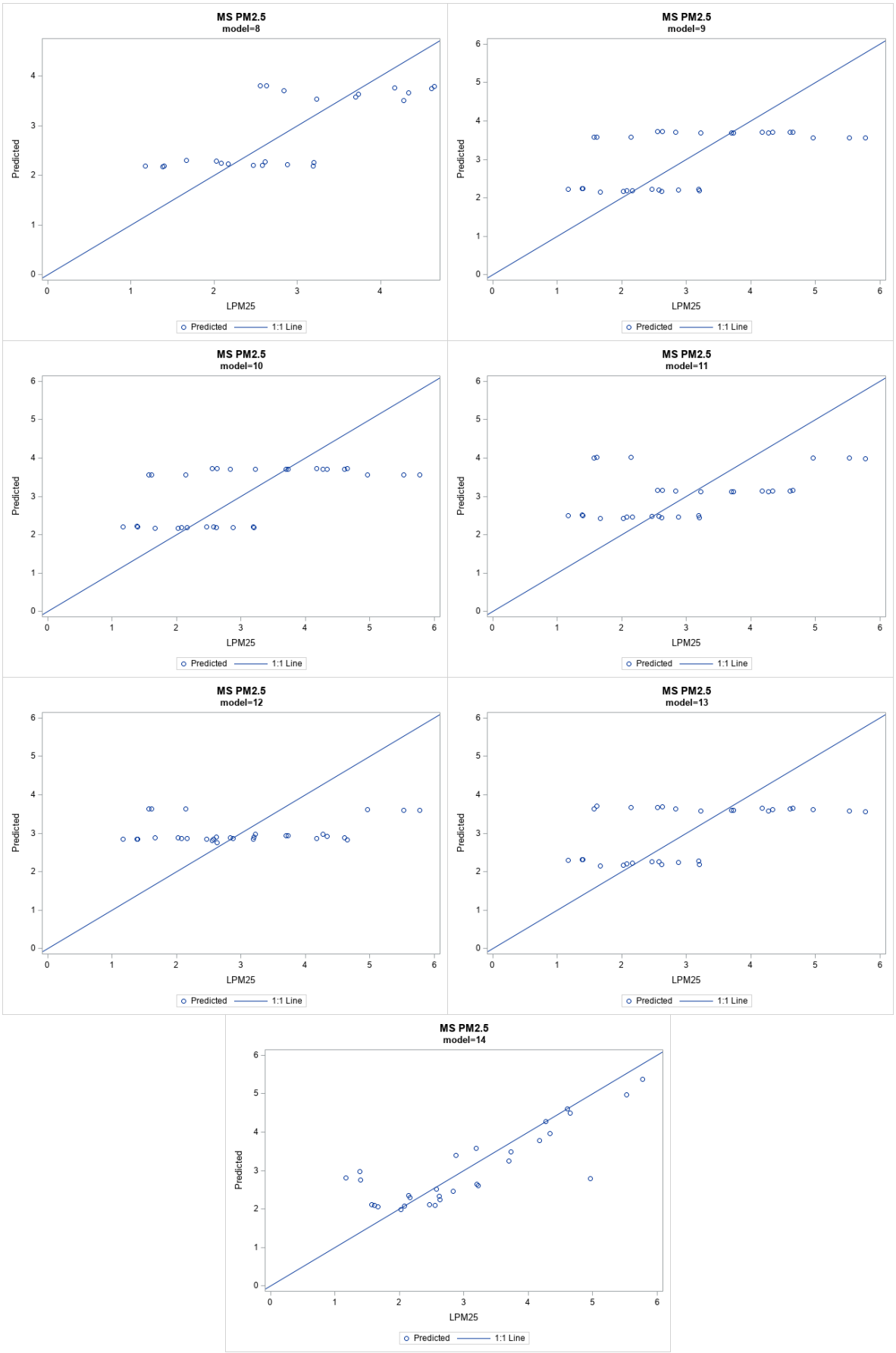

Figure G-30. Layer manure shed $PM_{2.5}$ one-to-one plots models 7 through 14.

Table G-35. Parameter and estimates for layer manure shed TSP emission models tested.

Model	Parameter	Estimate	Standard Error	p-value
P-1	Intercept	0.573094	12.2988	**0.9636**
	Inventory	0.006529	0.02523	**0.8001**
	Airflow	0.096594	0.03436	*0.0115*
P-2	Intercept	0.45394	12.3709	**0.9713**
	Inventory (5 day lag)	0.006766	0.02535	**0.7939**
	Airflow	0.096613	0.03436	*0.0115*
P-3	Intercept	5.424643	8.49308	**0.5346**
	Live animal weight	-0.002454	0.01244	**0.8468**
	Airflow	0.096379	0.03437	*0.0116*
P-4	Intercept	6.812837	8.29716	**0.427**
	Live animal weight (5 day lag)	-0.004473	0.01209	**0.7176**
	Airflow	0.095721	0.03427	*0.0119*
P-5	Intercept	4.283506	15.8341	**0.7917**
	Inventory (5 day lag)	0.001656	0.03259	**0.9604**
	Wind speed	0.081591	0.35102	**0.8195**
P-6	Intercept	3.895732	15.7494	**0.8091**
	Inventory (5 day lag)	0.002475	0.03233	**0.9403**
	Ambient Temperature	0.003544	0.0278	**0.9008**
P-7	Intercept	0.71152	16.7371	**0.9668**
	Inventory (5 day lag)	0.007148	0.03345	**0.8347**
	Ambient relative humidity	0.01393	0.0231	**0.5554**
P-8	Intercept	-1188.806	960.653	**0.2399**
	Inventory (5 day lag)	2.253253	1.81283	**0.2379**
	Average hen age	0.236659	0.19058	**0.2384**
P-9	Intercept	4.041666	15.7641	**0.8022**
	FF	0	.	.
	Inventory (5 day lag)	0.002286	0.03241	**0.945**
P-10	Intercept	-4.789205	17.7638	**0.7922**
	Inventory (5 day lag)	0.020979	0.03682	**0.5797**
	Manure age	-0.001618	0.0017	**0.3612**
P-11	Intercept	4.041666	15.7641	**0.8022**
	Inventory (5 day lag)	0.002286	0.03241	**0.945**
P-12	Intercept	9.118039	10.5292	**0.4043**
	Live animal weight (5 day lag)	-0.005805	0.01541	**0.7133**
P-13	Intercept	3.752372	0.53756	<.0001
	Airflow	0.096097	0.0344	*0.0119*

Table G-36. Fit and evaluation statistics for the layer manure shed TSP models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME[a] (%)	NME[b] (%)	ME[b] (kg day^{-1})	MB[b] (kg day^{-1})	NMB[b] (%)
P-1	75	85	88	90	0.415	20.19	95.71	303.7	61.59	19.41
P-2	75	85	88	90	0.415	20.2	95.77	303.9	61.69	19.44
P-3	75	85	88	91	0.414	20	92.14	292.4	54.35	17.13
P-4	75	85	88	90	0.416	19.86	90.65	287.6	51.84	16.34
P-5	81	91	95	97	0.1	20.46	88.18	279.8	1.329	0.419
P-6	81	91	95	97	.	20.62	88.91	282.1	1.228	0.387
P-7	81	91	95	97	0.165	20.73	87.74	278.4	4.4	1.387
P-8	80	90	94	96	0.201	20.33	85.05	269.8	-1.817	-0.573
P-9	81	89	92	94	0.005	20.63	88.5	280.8	1.141	0.36
P-10	81	91	94	96	0.147	20.28	88.04	279.3	0.192	0.06
P-11	81	89	92	94	0.005	20.63	88.5	280.8	1.141	0.36
P-12	81	89	92	94	0.059	19.95	86.11	273.2	-5.478	-1.727
P-14	75	83	85	87	0.414	20.03	93.53	296.8	57.7	18.19

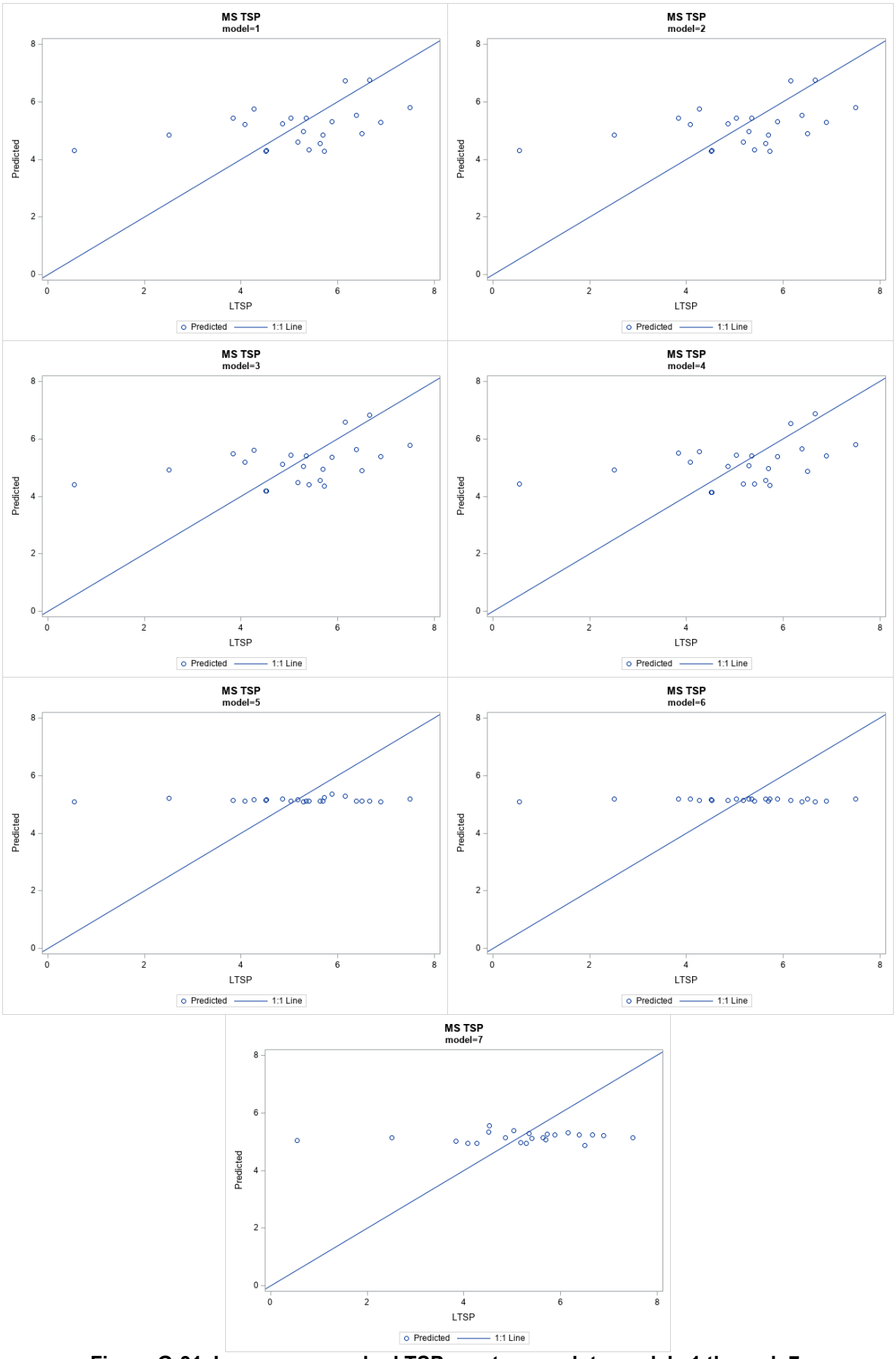

Figure G-31. Layer manure shed TSP one-to-one plots models 1 through 7.

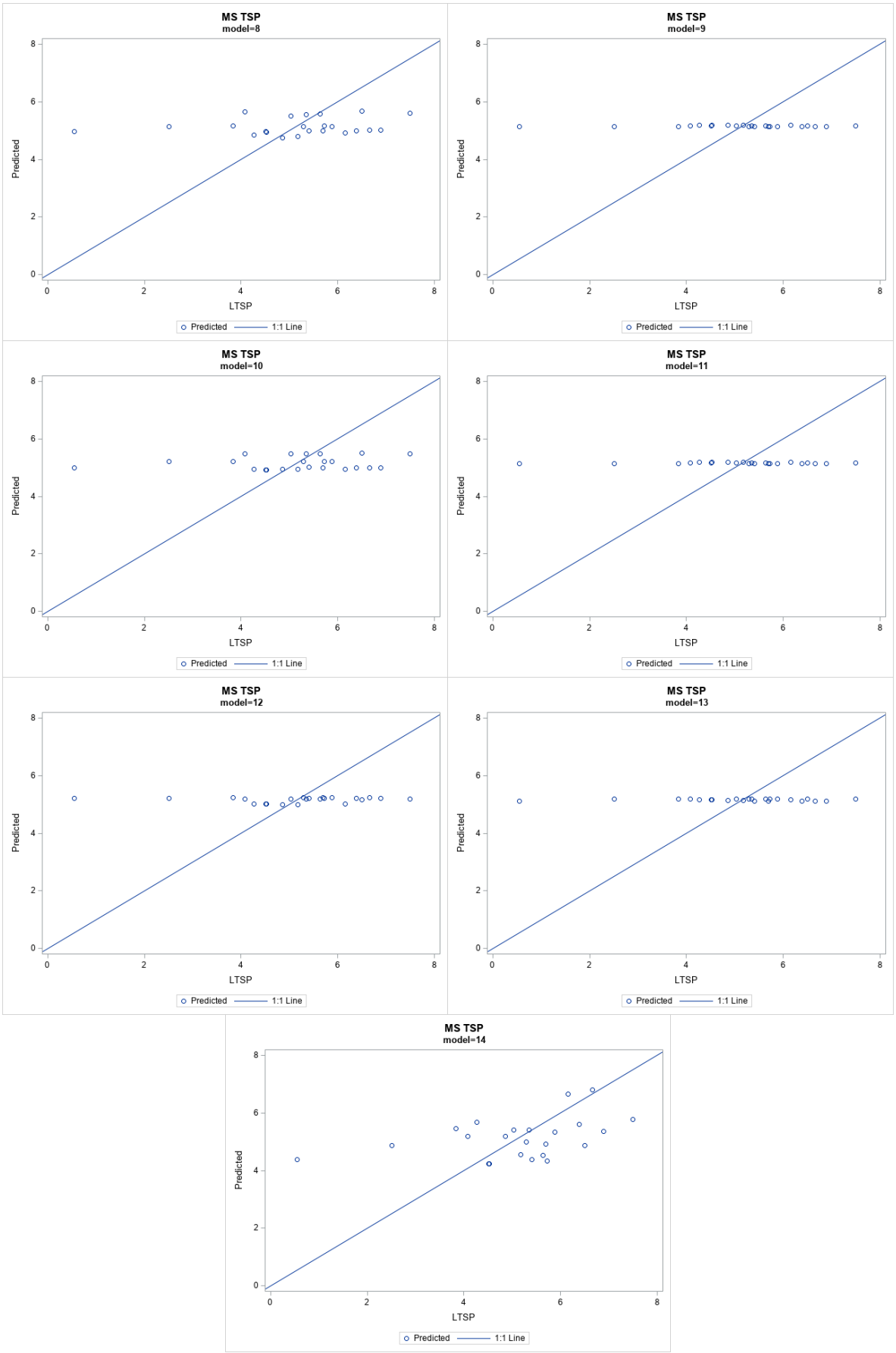

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Figure H-1. Time series comparison of model (points) and observed (line) NH_3 emissions.

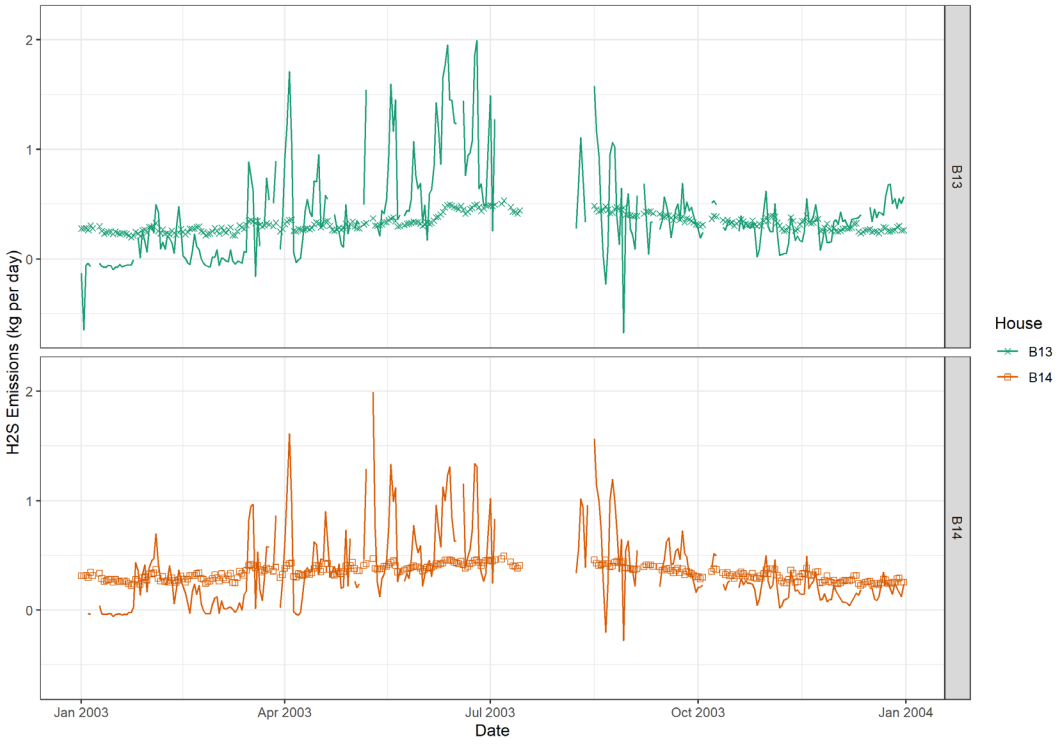

Figure H-2. Time series comparison of model (points) and observed (line) H_2S emissions.

Figure H-3. Time series comparison of model (points) and observed (line) PM_{10} emissions.

Table H-1. Model performance statistics, overall.

Pollutant	n	MB (kg)	ME (kg)	NMB (%)	NME (%)	r
NH_3	544	-164.32	204.96	-51%	64%	-0.38
H_2S	578	-0.05	0.24	-13%	64%	0.63
PM_{10}	560	-7,542.73	7938.27	-53%	56%	0.37

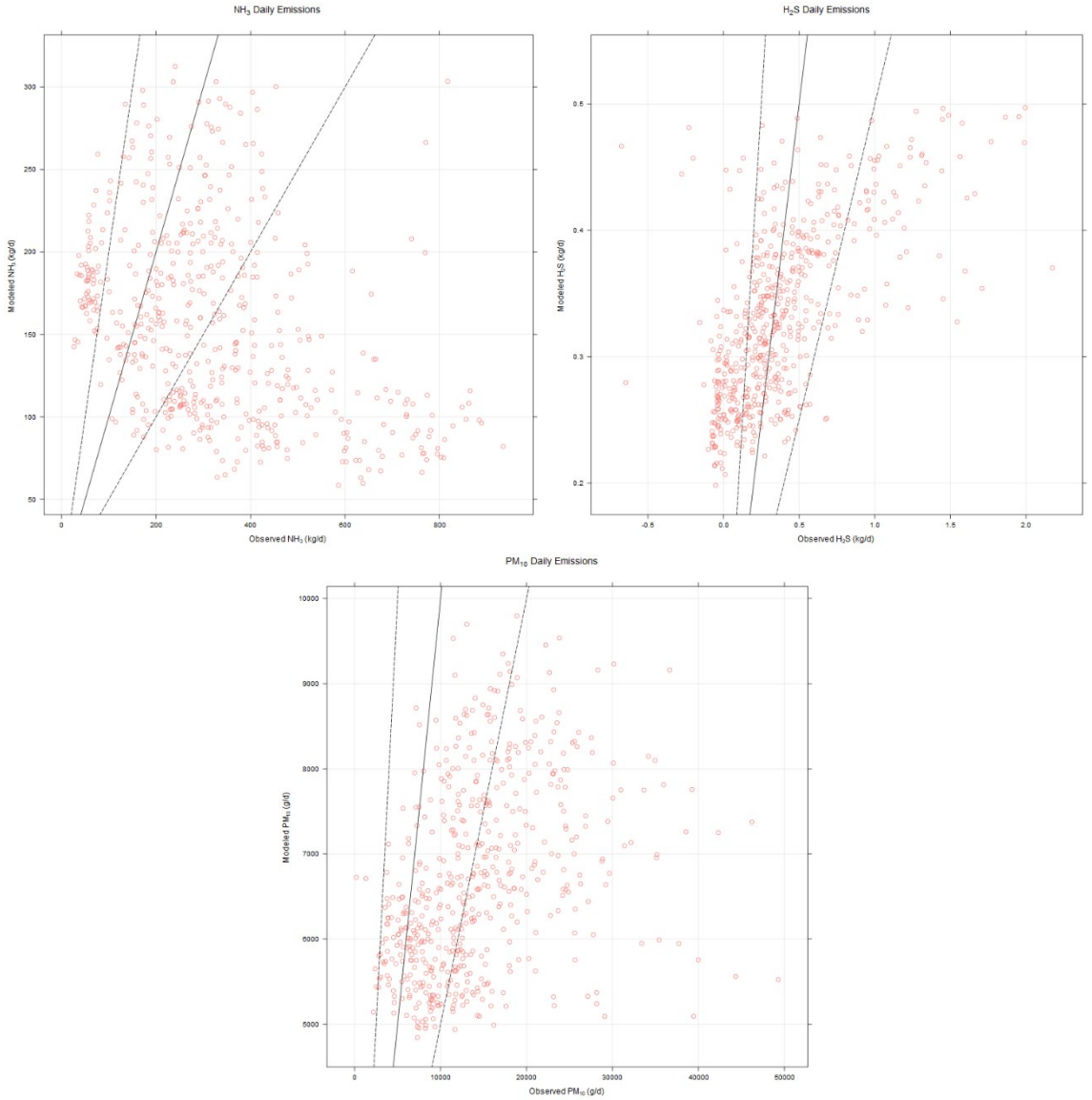

Figure H-4. Scatter plots of model versus observed emissions.

Table H-2. Model performance statistics by house.

Pollutant	House	n	MB (kg)	ME (kg)	NMB (%)	NME (%)	r
NH_3	B13	273	-219.44	249.51	-59%	67%	-0.39
NH_3	B14	271	-108.80	160.09	-41%	60%	-0.41
H_2S	B13	290	-0.08	0.27	-21%	67%	0.60
H_2S	B14	288	-0.01	0.22	-4%	61%	0.71
PM_{10}	B13	282	-9923.98	10008.56	-60%	61%	0.39
PM_{10}	B14	278	-5127.22	5838.18	-43%	49%	0.48

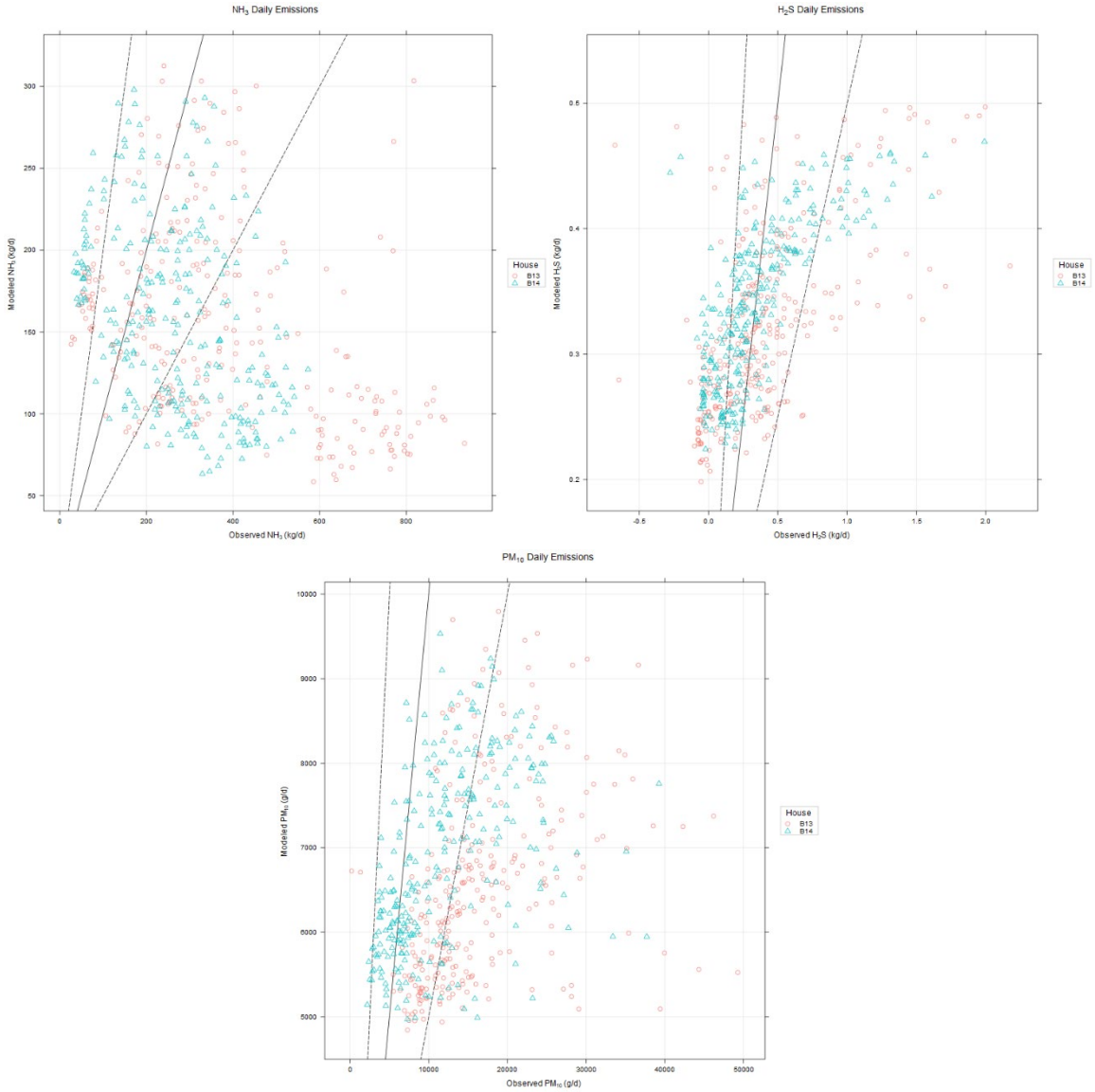

Figure H-5. Scatter plots of model versus observed emissions, color coded by house.

Table H-3. Model performance statistics by season.

Pollutant	House	n	MB (kg)	ME (kg)	NMB (%)	NME (%	r
NH_3	spring (MAM)	166	-137.85	220.95	-46%	74%	-0.49
NH_3	summer (JJA)	68	6.36	99.02	3%	40%	0.55
NH_3	autumn (SON)	156	-73.79	81.15	-30%	34%	0.40
NH_3	winter (DJF)	154	-359.93	359.93	-79%	79%	-0.25
H_2S	spring (MAM)	166	-0.11	0.29	-25%	65%	0.59
H_2S	summer (JJA)	94	-0.35	0.48	-45%	61%	0.31
H_2S	autumn (SON)	154	0.04	0.12	12%	39%	0.65
H_2S	winter (DJF)	164	0.10	0.19	65%	116%	0.26
PM_{10}	spring (MAM)	162	-6503.98	6734.67	-49%	50%	0.12
PM_{10}	summer (JJA)	97	-12010.28	12010.28	-59%	59%	-0.11
PM_{10}	autumn (SON)	135	-8742.36	9012.29	-57%	59%	0.38
PM_{10}	winter (DJF)	166	-4970.31	5859.97	-47%	55%	-0.19

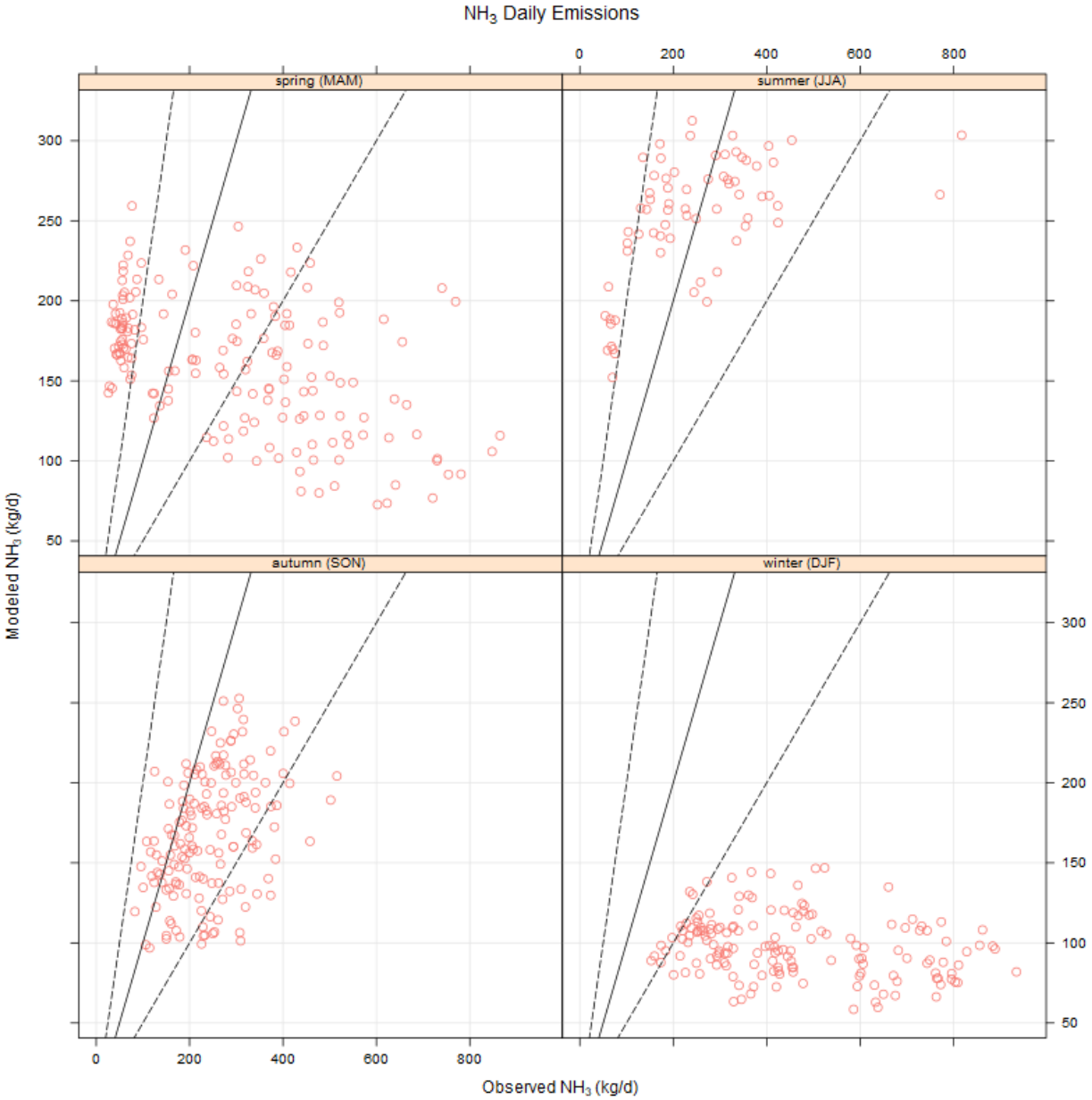

Figure H-6. Scatter plots of model versus observed NH_3 emissions by season.

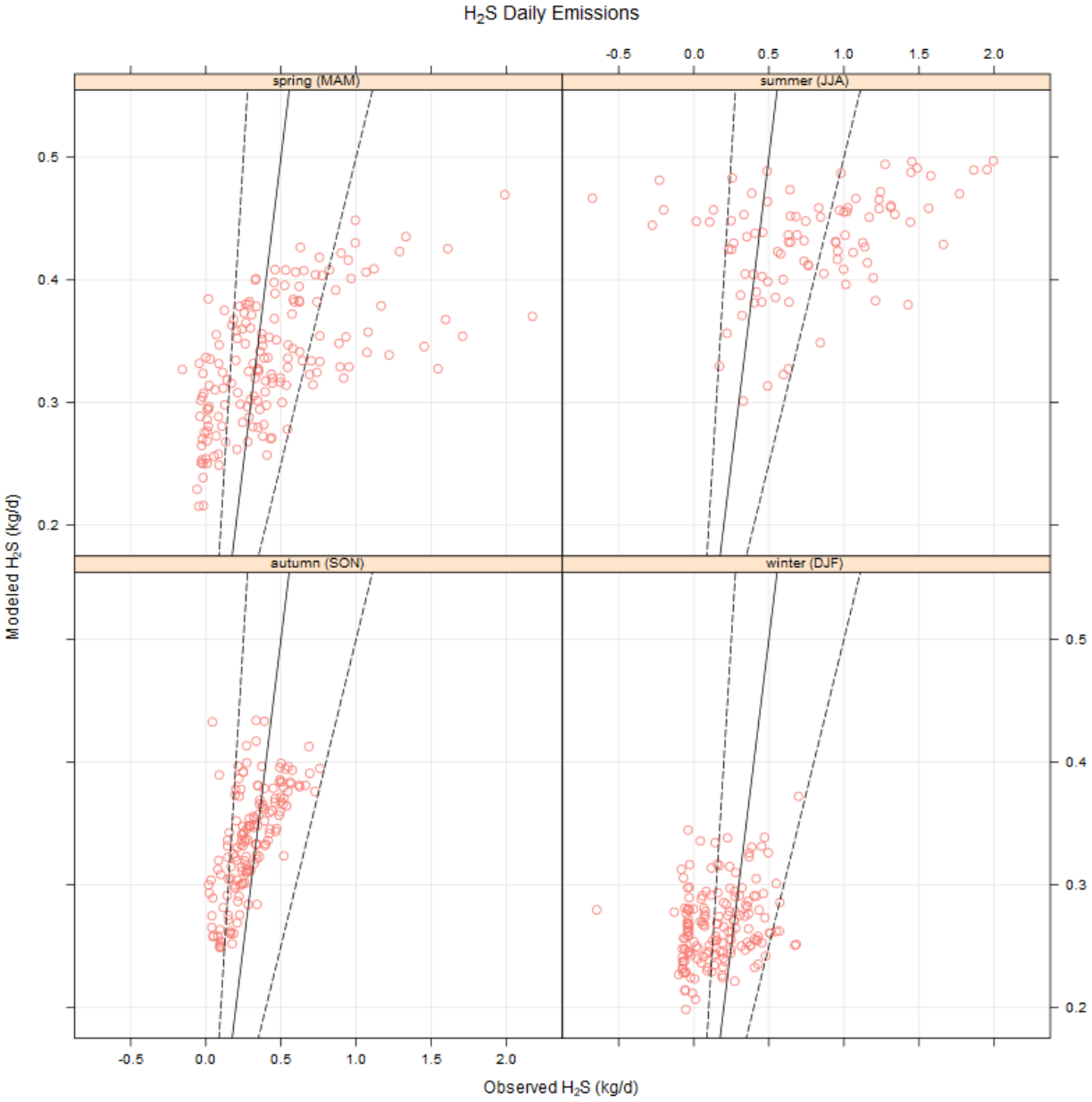

Figure H-7. Scatter plots of model versus observed H_2S emissions by season.

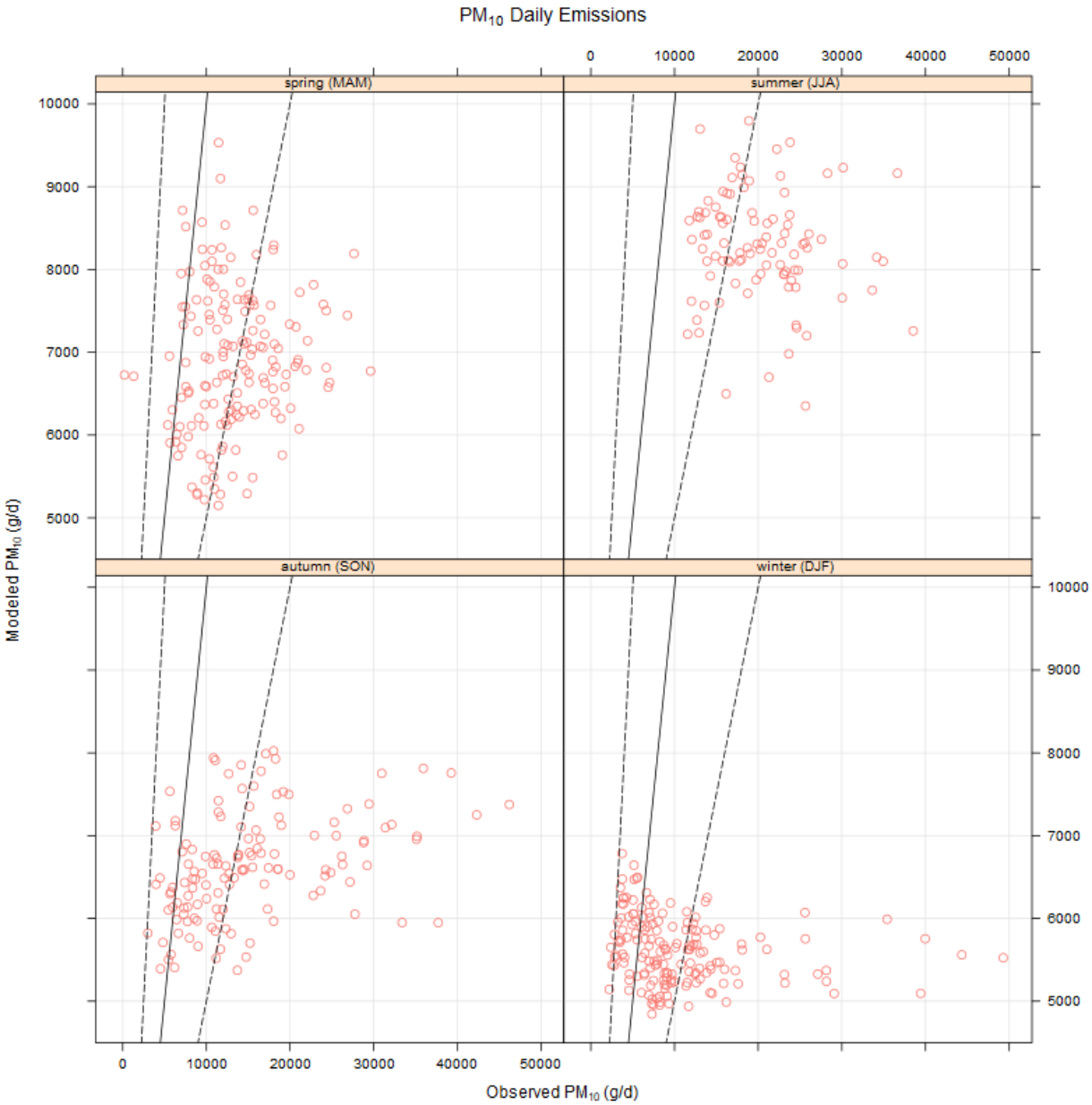

Figure H-8. Scatter plots of model versus observed PM_{10} emissions by season.

Table H-4. Model performance statistics by house, by season.

Pollutant	House	season	n	MB	MGE	NMB	NMGE	r
NH_3	B13	spring (MAM)	81	-189.02	263.65	-55%	77%	-0.47
NH_3	B13	summer (JJA)	34	-47.78	106.98	-16%	35%	0.59
NH_3	B13	autumn (SON)	80	-97.76	99.65	-36%	37%	0.26
NH_3	B13	winter (DJF)	78	-450.65	450.65	-82%	82%	-0.39
NH_3	B14	spring (MAM)	85	-89.08	180.25	-34%	70%	-0.50
NH_3	B14	summer (JJA)	34	60.51	91.07	32%	48%	0.54
NH_3	B14	autumn (SON)	76	-48.57	61.67	-23%	29%	0.56
NH_3	B14	winter (DJF)	76	-266.84	266.84	-73%	73%	0.14
H_2S	B13	spring (MAM)	81	-0.16	0.32	-34%	68%	0.75
H_2S	B13	summer (JJA)	47	-0.44	0.59	-50%	67%	0.29
H_2S	B13	autumn (SON)	79	0.03	0.11	11%	35%	0.57
H_2S	B13	winter (DJF)	83	0.08	0.21	43%	115%	0.32
H_2S	B14	spring (MAM)	85	-0.06	0.26	-15%	61%	0.79
H_2S	B14	summer (JJA)	47	-0.26	0.37	-38%	54%	0.31
H_2S	B14	autumn (SON)	75	0.04	0.12	14%	42%	0.74
H_2S	B14	winter (DJF)	81	0.13	0.17	92%	117%	0.30
PM_{10}	B13	spring (MAM)	82	-8690.21	8980.75	-57%	59%	0.55
PM_{10}	B13	summer (JJA)	47	-12943.57	12943.57	-61%	61%	-0.11
PM_{10}	B13	autumn (SON)	66	-10949.46	10949.89	-62%	62%	0.45
PM_{10}	B13	winter (DJF)	87	-8677.62	8677.62	-61%	61%	0.15
PM_{10}	B14	spring (MAM)	80	-4263.08	4432.45	-37%	38%	0.23
PM_{10}	B14	summer (JJA)	50	-11132.98	11132.98	-58%	58%	-0.21
PM_{10}	B14	autumn (SON)	69	-6631.23	7158.93	-50%	54%	0.26
PM_{10}	B14	winter (DJF)	79	-887.58	2757.00	-13%	41%	-0.35