

Appendix A: PM Sampling

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A.1 Overall Sampling Schedule

Table A-1. Open Source Sampling Schedule.

Site	Source Type	Manure Collection	Period											
			1	2	3	4	5	6	7a	7b	8	9	10	
IN5A	Lagoon	Flush							9/11/08 - 12/10/08	12/11/08 - 2/25/09		3/11/09 - 5/28/09	5/29/09 - 8/24/2009	
WA5A ³	Lagoon	Flush			2/25/08 - 3/12/08	3/12/08 - 3/26/08	8/8/08 - 9/3/08	9/3/08 - 9/26/08				5/18/09 - 6/4/09	6/4/09 - 6/20/09	
WI5A ³	Lagoon ²	Flush	7/18/07 - 8/28/07	11/13/07 - 11/28/07	11/28/07 - 12/18/07	4/23/08 - 5/13/08	6/25/08 - 7/14/08	10/21/08 - 11/11/08		12/17/08 - 1/7/09		3/10/09 - 4/7/09		
TX5A	Corral	Dry lot		9/19/07 - 11/6/07	1/8/08 - 1/23/08	4/1/08 - 4/23/08	6/10/08 - 7/1/08	10/15/08 - 11/4/08	12/16/08 - 1/6/09	1/27/09 - 2/19/09	2/19/09 - 3/18/09	8/3/09 - 8/27/09		

¹ Characterizes type of farm.

² Lagoon can be single or double stage.

³ Area site that also had barn monitoring sites during NAEMS.

A.2 PM Sampling Schedules

Table A-2. PM Sampling Schedule CA5B.

Day, m/d/y		Test duration (days)		
Start	Stop	PM ₁₀	TSP	PM _{2.5}
9/26/07	1/20/08	116.5		
1/20/08	2/18/08		29.0	
2/18/08	2/29/08			11.0
2/29/08	6/4/08	95.9		
6/4/08	6/12/08		7.8	
6/12/08	6/23/08		10.9*	
6/12/08	6/23/08	10.9**		
6/23/08	9/11/08	80.1		
9/11/08	10/2/08		20.8	
10/2/08	10/11/08			8.8
10/11/08	1/14/09	95.6		
1/14/09	1/27/09		12.9	
1/27/09	2/23/09			26.7
2/23/09	6/15/09	112.2		
6/15/09	7/7/09		22.0	
7/7/09	7/17/09			9.8
7/17/09	7/22/09			5.1‡‡
7/17/09	7/22/09	5.0 ††		
7/22/09	9/26/09	66.0		
Totals		566	70	56

* All except ambient

** Only ambient

†† Only B1

‡‡ All except B1

Table A-3. PM Sampling Schedule IN5B.

Time and day, m/d/y		Test duration, d		
Start	Stop	PM ₁₀	TSP	PM _{2.5}
9/8/07 0:00	11/5/07 10:30	58.4		
11/5/07 10:30	11/14/07 10:30		9.0	
11/14/07 10:30	1/4/08 13:00	51.1		
1/4/08 13:00	1/11/08 12:00		7.0	
1/11/08 13:00	1/25/08 16:00			14.1
1/25/08 16:00	3/20/08 12:10	54.8		
3/20/08 12:10	3/27/08 12:40		7.0	
3/27/08 12:40	6/16/08 12:55	81.0		
6/16/08 12:55	6/24/08 10:00		7.9	
6/24/08 10:00	9/10/08 14:25	78.2		
9/10/08 14:25	9/19/08 13:45		9.0	
9/19/08 13:45	9/25/08 9:25	5.8		
9/25/08 9:25	9/29/08 8:30			4.0
9/29/08 8:30	9/29/08 14:37		0.3	
9/29/08 14:37	10/1/08 9:10			1.8
10/1/08 9:10	10/13/08 12:39		12.1	
10/13/08 12:39	11/25/08 9:58	42.9		
11/25/08 9:58	11/25/08 12:30			0.1
11/25/08 12:30	12/2/08 14:15	7.1		
12/2/08 14:15	12/4/08 14:13		2.0	
12/4/08 14:13	12/8/08 9:27	3.8		
12/8/08 11:21	12/10/08 10:44			
12/20/08 9:00	12/29/08 13:57		9.2	
12/29/08 13:42	2/2/09 11:52	34.9		
2/2/09 11:52	2/16/09 14:49			14.1
2/16/09 14:49	3/3/09 12:32		14.9	
3/3/09 12:45	3/23/09 12:01	20.0		
3/23/09 13:00	3/30/09 10:00		6.9	
3/30/09 11:00	4/17/09 11:30	18.0		
4/17/09 11:30	4/20/09 8:15			2.9
4/20/09 8:15	5/27/09 11:00	37.1		
5/27/09 11:00	6/1/09 11:27		5.0	
6/1/09 11:27	7/13/09 10:38	42.0		
7/13/09 10:38	7/24/09 9:55		11.0	
7/24/09 10:16	8/10/09 7:50			16.9
8/10/09 8:11	9/12/09 23:59	33.7		
Totals:		569	101	54

Table A-4. PM Sampling Schedule NY5B.

Day, m/d/y		Test duration, d		
Start	Stop	PM ₁₀	TSP	PM _{2.5}
10/24/07	12/14/07	51.6		
12/14/07	12/21/07		7.0	
12/21/07	1/11/08	20.8		
1/11/08	1/25/08			14.0
1/25/08	2/13/08	19.1		
2/13/08	2/21/08		7.7	
2/21/08	4/4/08	43.1		
4/4/08	4/11/08		7.0	
4/11/08	6/24/08	73.9		
6/24/08	7/10/08		15.9	
7/10/08	7/24/08	13.8		
7/24/08	8/27/08			34.2
8/27/08	11/4/08	68.6		
11/4/08	11/24/08			19.9
11/24/08	1/13/09	49.9		
1/13/09	1/20/09		6.9	
1/20/09	3/13/09	52.0		
3/13/09	3/19/09		5.9	
3/19/09	5/11/09	52.9		
5/11/09	5/18/09		7.0	
5/18/09	9/8/09	113.0		
9/8/09	10/24/09	45.6†		
9/8/09	9/21/09		13.0‡	
9/21/09	10/24/09	32.6‡		
Totals		636.9	70.5	68.1

† Only B1F15

‡ All except B1F15

Table A-5. PM Sampling Schedule WA5B.

Day, m/d/y		Test duration, d		
Start	Stop	PM ₁₀	TSP	PM _{2.5}
9/28/07	1/17/08	111.6		
1/17/08	2/7/08			21.1
2/7/08	4/10/08	62.9		
4/10/08	4/24/08		13.9	
4/24/08	6/12/08	49.1		
6/12/08	6/18/08		6.0	
6/18/08	7/10/08	22.0		
7/10/08	7/23/08			12.9
7/23/08	9/12/08	50.9		
9/12/08	9/18/08		6.0	
9/18/08	11/13/08	56.0		
11/13/08	11/21/08		8.0	
11/21/08	2/12/09	82.9		
2/12/09	2/26/09			14.0
2/26/09	3/4/09		6.1	
3/4/09	4/30/09	57.0		
4/30/09	5/7/09		7.0	
5/7/09	7/8/09	62.1		
7/8/09	7/22/09			14.0
7/22/09	7/30/09	7.9		
7/30/09	8/5/09		6.2	
8/5/09	9/27/09	53.4		
Totals		615.8	53.1	62.1

Table A-6. PM Sampling Schedule WI5B.

Time and day (m/d/y)		Test duration, d		
Start	Stop	PM ₁₀	TSP	PM _{2.5}
9/12/07	12/11/07	90.5		
12/11/07	12/17/07		6.1	
12/17/07	1/15/08	28.9		
1/15/08	2/5/08			21.0
2/5/08	2/19/08	14.0		
2/19/08	2/26/08		6.9	
2/26/08	3/17/08	20.1		
3/17/08	3/25/08		7.9	
3/25/08	4/29/08	34.9		
4/29/08	5/5/08		6.0	
5/5/08	6/19/08	45.0		
6/19/08	6/26/08		7.0	
6/26/08	8/1/08	35.9		
8/1/08	8/18/08			17.0
8/18/08	8/25/08		7.1	
8/25/08	10/14/08	50.0		
10/14/08	10/28/08		14.2	
10/28/08	12/16/08	48.8		
12/16/08	12/30/08		14.0	
12/30/08	1/13/09	13.9		
1/13/09	1/27/09			14.0
1/27/09	2/17/09	21.0		
2/17/09	2/24/09		6.9	
2/24/09	4/6/09	41.1		
4/6/09	4/14/09		7.9	
4/14/09	6/3/09	50.0		
6/3/09	6/8/09		5.3	
6/8/09	7/6/09	28.0		
7/6/09	7/21/09			14.7
7/21/09	8/4/09	14.0		
8/4/09	8/11/09		7.0	
8/11/09	9/15/09	35.0		
Totals		571.2	96.3	66.7

Appendix B: Data Processing

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B.1 Negative Emission Value Assessment Method

Negative calculated emission values can occur in NAEMS data set 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 gaseous pollutant), or continuously without correction for lag time in the barn (PM). The limited and uncorrected background concentrations can be biased, either negatively or positively, due to instrument “noise” or adjustment of calibration offset procedure. When this bias is negative, it introduces the potential for negative emission values. Negative emission values should be retained because omitting this data could bias the model high.
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 $\pm 27\%$ and $\pm 32\%$ for mechanically ventilated barns and $\pm 50\%$ and $\pm 53\%$ 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 through Table B-10 summarize the changes to the data set due to the negative emission removal.

Table B-1. Summary of the effect of applying the negative emission cut-off to dairy barn NH₃ emissions (kg/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
CA5B B1	Original Data Set	2.95	4.11	191	2.54	-8.57	21.16	1.39	37
	Revised Data Set	3.75	3.54	170	3.29	-0.86	21.16	0.95	16
	Difference	0.80	-0.57	21	0.75	7.71	0.00	-0.45	21
CA5B B2	Original Data Set	2.76	3.76	223	2.67	-10.77	15.37	1.36	42
	Revised Data Set	3.64	3.01	194	3.16	-0.91	15.37	0.83	13
	Difference	0.88	-0.76	29	0.49	9.86	0.00	-0.54	29
IN5B B1	Original Data Set	40.34	25.27	467	33.71	3.42	122.62	0.63	0
	Revised Data Set	40.34	25.27	467	33.71	3.42	122.62	0.63	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
IN5B B2	Original Data Set	39.79	24.10	478	34.47	3.03	119.73	0.61	0
	Revised Data Set	39.79	24.10	478	34.47	3.03	119.73	0.61	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NY5B B1	Original Data Set	21.69	8.09	350	20.17	6.81	45.26	0.37	0
	Revised Data Set	21.69	8.09	350	20.17	6.81	45.26	0.37	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WA5B B2	Original Data Set	26.60	29.43	125	21.91	-156.36	96.60	1.11	2
	Revised Data Set	29.09	21.81	123	22.06	0.52	96.60	0.75	0
	Difference	2.49	-7.62	2	0.16	156.88	0.00	-0.36	2
WA5B B4	Original Data Set	54.65	31.64	99	45.13	9.03	170.93	0.58	0
	Revised Data Set	54.65	31.64	99	45.13	9.03	170.93	0.58	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WI5B B1	Original Data Set	8.58	2.83	564	8.22	3.75	19.14	0.33	0
	Revised Data Set	8.58	2.83	564	8.22	3.75	19.14	0.33	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WI5B B2	Original Data Set	11.22	4.56	524	10.74	3.37	26.55	0.41	0
	Revised Data Set	11.22	4.56	524	10.74	3.37	26.55	0.41	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = No change in dataset

Table B-2. Summary of the effect of applying the negative emission cut-off to dairy barn H₂S emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
CA5B B1	Original Data Set	487.25	740.76	212	569.87	-2,418.29	3,775.09	1.52	37
	Revised Data Set	634.01	558.98	192	646.11	-175.56	3,775.09	0.88	17
	Difference	146.76	-181.78	20	76.24	2,242.72	0.00	-0.64	20
CA5B B2	Original Data Set	669.69	515.92	269	680.39	-609.03	2,644.93	0.77	18
	Revised Data Set	690.49	497.50	264	691.60	-166.03	2,644.93	0.72	13
	Difference	20.79	-18.41	5	11.21	443.00	0.00	-0.05	5
IN5B B1	Original Data Set	1,480.66	16,908.71	522	228.55	-284.20	386,451.70	11.42	49
	Revised Data Set	758.10	949.99	512	236.80	-80.10	5,809.50	1.25	40
	Difference	-722.56	-15,958.73	10	8.25	204.10	-380,642.20	-10.17	9
IN5B B2	Original Data Set	1,067.52	1,500.87	552	463.35	-226.60	11,093.10	1.41	24
	Revised Data Set	1,069.87	1,501.22	551	479.00	-139.90	11,093.10	1.40	23
	Difference	2.35	0.35	1	15.65	86.70	0.00	0.00	1
NY5B B1	Original Data Set	523.69	430.82	467	378.91	34.05	2,183.82	0.82	0
	Revised Data Set	523.69	430.82	467	378.91	34.05	2,183.82	0.82	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WA5B B2	Original Data Set	555.61	1,746.24	116	192.14	-5,400.93	6,513.61	3.14	45
	Revised Data Set	1,054.52	1,529.29	91	431.84	-240.39	6,513.61	1.45	20
	Difference	498.91	-216.95	25	239.70	5,160.54	0.00	-1.69	25
WA5B B4	Original Data Set	1,130.95	3,503.40	104	690.94	-11,640.14	17,960.29	3.10	30
	Revised Data Set	2,159.19	3,002.40	81	1,189.54	-324.98	17,960.29	1.39	7
	Difference	1,028.24	-501.00	23	498.60	11,315.16	0.00	-1.71	23
WI5B B1	Original Data Set	1.04	1.30	582	0.39	-0.01	8.20	1.24	3
	Revised Data Set	1.04	1.30	582	0.39	-0.01	8.20	1.24	3
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WI5B B2	Original Data Set	0.86	1.08	545	0.23	-0.20	5.31	1.25	8
	Revised Data Set	0.87	1.08	541	0.24	-0.07	5.31	1.24	4
	Difference	0.01	0.00	4	0.01	0.14	0.00	-0.01	4

n/a = No change in dataset

Table B-3. Summary of the effect of applying the negative emission cut-off to dairy barn PM₁₀ emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
CA5B B1	Original Data Set	-325.77	1,108.73	520	-302.25	-5,733.05	6,135.13	-3.40	372
	Revised Data Set	559.36	926.13	205	271.63	-150.91	6,135.13	1.66	57
	Difference	885.13	-182.60	315	573.88	5,582.15	0.00	5.06	315
CA5B B2	Original Data Set	592.97	2,143.17	451	11.58	-7,732.99	14,371.93	3.61	221
	Revised Data Set	1,200.13	2,163.40	324	416.48	-320.54	14,371.93	1.80	94
	Difference	607.15	20.23	127	404.90	7,412.45	0.00	-1.81	127
IN5B B1	Original Data Set	19.41	300.16	368	18.31	-1,376.97	3,571.86	15.46	158
	Revised Data Set	121.56	179.18	234	78.85	-23.80	2,069.94	1.47	25
	Difference	102.15	-120.97	134	60.54	1,353.17	-1,501.92	-13.99	133
IN5B B2	Original Data Set	130.40	209.40	348	141.52	-1,161.89	1,083.87	1.61	71
	Revised Data Set	182.07	159.76	302	166.63	-55.35	1,083.87	0.88	25
	Difference	51.67	-49.64	46	25.11	1,106.54	0.00	-0.73	46
NY5B B1	Original Data Set	223.73	337.46	328	72.89	-406.14	2,101.45	1.51	8
	Revised Data Set	229.12	335.64	324	73.93	-21.40	2,101.45	1.46	4
	Difference	5.39	-1.82	4	1.05	384.74	0.00	-0.04	4
WA5B B2	Original Data Set	4,497.74	17,839.79	452	1,590.37	-20,331.95	353,457.48	3.97	53
	Revised Data Set	5,001.87	18,160.35	428	1,734.92	-547.21	353,457.48	3.63	29
	Difference	504.12	320.56	24	144.55	19,784.73	0.00	-0.34	24
WA5B B4	Original Data Set	11,391.71	24,574.35	418	4,958.78	-7,473.60	367,744.48	2.16	14
	Revised Data Set	11,664.78	24,691.71	411	5,080.35	-1,591.37	367,744.48	2.12	7
	Difference	273.08	117.36	7	121.57	5,882.23	0.00	-0.04	7
WI5B B1	Original Data Set	363.37	578.04	400	117.65	-553.04	3,888.47	1.59	37
	Revised Data Set	376.45	577.56	391	120.67	-41.61	3,888.47	1.53	28
	Difference	13.08	-0.48	9	3.02	511.44	0.00	-0.06	9
WI5B B2	Original Data Set	562.91	818.39	362	169.16	-462.86	4,553.70	1.45	9
	Revised Data Set	571.92	818.28	358	171.73	-43.53	4,553.70	1.43	5
	Difference	9.00	-0.11	4	2.57	419.33	0.00	-0.02	4

n/a = No change in dataset

Table B-4. Summary of the effect of applying the negative emission cut-off to dairy barn PM_{2.5} emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
CA5B B1	Original Data Set	-905.18	1,423.62	47	-573.67	-9,203.14	101.31	-1.57	44
	Revised Data Set	63.26	36.78	3	60.56	27.90	101.31	0.58	0
	Difference	968.44	-1,386.84	44	634.23	9,231.04	0.00	2.15	44
CA5B B2	Original Data Set	-607.29	1,570.75	54	-303.17	-9,932.95	458.02	-2.59	40
	Revised Data Set	260.77	122.84	14	260.50	82.11	458.02	0.47	0
	Difference	868.06	-1,447.91	40	563.66	10,015.06	0.00	3.06	40
IN5B B1	Original Data Set	21.18	114.16	28	32.61	-329.99	208.10	5.39	11
	Revised Data Set	69.60	65.33	21	74.59	-29.74	208.10	0.94	4
	Difference	48.42	-48.83	7	41.99	300.25	0.00	-4.45	7
IN5B B2	Original Data Set	44.96	129.13	29	69.94	-304.84	206.93	2.87	10
	Revised Data Set	102.14	72.20	22	122.98	-21.95	206.93	0.71	3
	Difference	57.18	-56.93	7	53.04	282.89	0.00	-2.17	7
NY5B B1	Original Data Set	36.66	29.81	53	27.52	-3.16	113.84	0.81	2
	Revised Data Set	36.66	29.81	53	27.52	-3.16	113.84	0.81	2
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WA5B B2	Original Data Set	2,719.21	1,828.35	37	2,818.24	347.76	7,247.60	0.67	0
	Revised Data Set	2,719.21	1,828.35	37	2,818.24	347.76	7,247.60	0.67	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WA5B B4	Original Data Set	1,863.35	1,779.09	37	1,362.29	-676.29	6,474.69	0.95	6
	Revised Data Set	1,933.90	1,751.06	36	1,404.24	-401.24	6,474.69	0.91	5
	Difference	70.55	-28.03	1	41.95	275.05	0.00	-0.05	1
WI5B B1	Original Data Set	141.51	145.45	53	86.92	-27.13	538.99	1.03	7
	Revised Data Set	141.51	145.45	53	86.92	-27.13	538.99	1.03	7
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WI5B B2	Original Data Set	186.74	203.76	45	95.71	-4.26	805.76	1.09	1
	Revised Data Set	186.74	203.76	45	95.71	-4.26	805.76	1.09	1
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = No change in dataset

Table B-5. Summary of the effect of applying the negative emission cut-off to dairy barn TSP emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
CA5B B1	Original Data Set	4,766.27	7,249.04	71	2,525.45	-2,055.21	45,690.25	1.52	7
	Revised Data Set	4,863.72	7,254.39	70	2,902.71	-973.38	45,690.25	1.49	6
	Difference	97.45	5.35	1	377.25	1,081.82	0.00	-0.03	1
CA5B B2	Original Data Set	8,128.69	8,699.37	59	5,578.41	-235.60	43,350.07	1.07	4
	Revised Data Set	8,128.69	8,699.37	59	5,578.41	-235.60	43,350.07	1.07	4
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
IN5B B1	Original Data Set	347.60	333.86	77	310.35	-158.33	1,841.13	0.96	9
	Revised Data Set	367.18	325.66	74	317.81	-80.18	1,841.13	0.89	6
	Difference	19.58	-8.19	3	7.46	78.14	0.00	-0.07	3
IN5B B2	Original Data Set	328.95	273.76	67	267.19	-88.83	1,225.92	0.83	2
	Revised Data Set	328.95	273.76	67	267.19	-88.83	1,225.92	0.83	2
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NY5B B1	Original Data Set	218.66	308.10	41	208.45	-505.43	1,572.59	1.41	5
	Revised Data Set	271.81	270.81	37	216.50	-3.71	1,572.59	1.00	1
	Difference	53.15	-37.30	4	8.05	501.72	0.00	-0.41	4
WA5B B2	Original Data Set	19,331.70	25,603.35	38	8,286.13	1,413.48	122,272.14	1.32	0
	Revised Data Set	19,331.70	25,603.35	38	8,286.13	1,413.48	122,272.14	1.32	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WA5B B4	Original Data Set	47,389.03	71,484.69	38	25,605.49	4,817.02	374,175.36	1.51	0
	Revised Data Set	47,389.03	71,484.69	38	25,605.49	4,817.02	374,175.36	1.51	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
WI5B B1	Original Data Set	849.92	827.35	82	505.92	-450.25	3,302.96	0.97	6
	Revised Data Set	909.68	803.45	78	530.54	-110.45	3,302.96	0.88	2
	Difference	59.76	-23.90	4	24.62	339.80	0.00	-0.09	4
WI5B B2	Original Data Set	878.88	943.01	76	451.11	14.99	4,198.23	1.07	0
	Revised Data Set	878.88	943.01	76	451.11	14.99	4,198.23	1.07	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = No change in dataset

Table B-6. Summary of the effect of applying the negative emission cut-off to dairy milking center NH₃ emissions (kg/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
IN5B MC	Original Data Set	8.81	7.35	338	7.36	-0.66	35.89	0.83	0
	Revised Data Set	8.81	7.35	338	7.36	-0.66	35.89	0.83	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NY5B MC	Original Data Set	5.76	2.07	385	5.68	1.27	13.69	0.36	0
	Revised Data Set	5.76	2.07	385	5.68	1.27	13.69	0.36	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = No change in dataset

Table B-7. Summary of the effect of applying the negative emission cut-off to dairy barn H₂S emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
IN5B MC	Original Data Set	1,207.31	2,122.15	400	305.05	-478.50	17,787.00	1.76	79
	Revised Data Set	1,254.65	2,137.31	388	345.95	-191.00	17,787.00	1.70	67
	Difference	47.34	15.15	12	40.90	287.50	0.00	-0.05	12
NY5B MC	Original Data Set	129.49	113.00	551	92.13	7.20	628.84	0.87	0
	Revised Data Set	129.49	113.00	551	92.13	7.20	628.84	0.87	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = No change in dataset

Table B-8. Summary of the effect of applying the negative emission cut-off to dairy barn PM₁₀ emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
NY5B MC	Original Data Set	89.97	73.40	438	65.31	-81.12	484.51	0.82	3
	Revised Data Set	90.68	72.79	436	65.64	-1.42	484.51	0.80	1
	Difference	0.72	-0.61	2	0.34	79.70	0.00	-0.01	2

n/a = No change in dataset

Table B-9. Summary of the effect of applying the negative emission cut-off to dairy barn PM_{2.5} emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
NY5B MC	Original Data Set	26.56	27.50	44	23.70	2.80	188.76	1.04	0
	Revised Data Set	26.56	27.50	44	23.70	2.80	188.76	1.04	0
	Difference	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a = No change in dataset

Table B-10. Summary of the effect of applying the negative emission cut-off to dairy barn TSP emissions (g/d) data.

Site	Description	Avg	St Dev	N	Median	Min	Max	CV (%)	N < 0
NY5B MC	Original Data Set	115.88	95.69	42	100.22	-79.12	321.67	0.83	3
	Revised Data Set	124.73	89.02	40	101.04	-0.67	321.67	0.71	1
	Difference	8.84	-6.67	2	0.83	78.45	0.00	-0.11	2

n/a = No change in dataset

B.2 Open Source Data Preparation

The 2012 data sets for dairy open sources (lagoons, basins, and corrals) were provided to EPA by the principal investigator (PI) for the National Air Emissions Monitoring Study (NAEMS). The datasets contain 30-minute data values for ammonia (NH₃), obtained using the backward Lagrangian Stochastics (bLS) model and vertical radial plume mapping (VRPM), and hydrogen sulfide (H₂S) emissions, obtained using the bLS model only. The 2012 NAEMS data sets also included 30-minute data values for meteorological conditions (e.g., air temperature, relative humidity) for the dairy lagoon/basin and corral sites and lagoon/basin conditions (e.g., pH).

This appendix presents the analysis used to prepare the 2012 data for use in developing daily emissions estimating methodologies (EEMs) for dairy open sources. Section B.2.1 presents the original acceptance criteria, while Section B.2.2 presents the analysis of the revised bLS model acceptance criteria for dairy lagoons/basins and corrals. Section B.2.3 presents the processing and calculation steps followed to prepare the average daily emissions records from the NAEMS 30-minute data.

B.2.1 Acceptance Criteria of 2012 Data Sets

The 2012 bLS NH₃ data sets for lagoons and basins provided to EPA followed a set of acceptance criteria (i.e., all valid NH₃ bLS records meet these criteria), summarized in Table B-11. These criteria are the same criteria specified in Grant, et al. (2013). For bLS H₂S, the 2012 data sets for lagoons and basins reflect the acceptance criteria presented in Table B-12.

Table B-11. Summary of 2012 acceptance criteria for NH₃ bLS data for lagoons and basins.

Parameter	Acceptance Criteria
Monin-Obukov Length	Abs[>2 m]
Friction velocity (u*)	> 0.15 m/s
Standard deviation of wind direction	< 30°
Touchdown fraction	> 0.1
Background concentration	-0.1 to 0.1 ppmv

Table B-12. Summary of 2012 acceptance criteria for H₂S bLS data for lagoons and basins.

Parameter	Acceptance Criteria
Monin-Obukov Length	Abs[>2 m]
Friction velocity (u*)	> 0.15 m/s
Standard deviation of wind direction	< 30°
Touchdown fraction	> 0.1

However, it does not appear that the 2012 bLS H₂S data account for background concentration. Table B-13 shows the range of background concentrations for the valid bLS H₂S emissions records.

Table B-13. Summary of the effect of applying the negative emission cut-off to dairy barn data.

Site	Background Concentration Range
IN5A	-631.27 to 5,292.58 ppbv
WA5A	-377.79 to 757.18 ppbv
WI5A	-147.99 to 593.45 ppbv

The 2012 bLS NH₃ and H₂S data sets for TX5A provided to EPA reflect the acceptance criteria (i.e., all the valid emissions records meet these criteria) presented in Table B-14. However, all background concentration values for the valid bLS NH₃ and H₂S emissions records are 0.

Table B-14. Summary of 2012 acceptance criteria for NH₃ and H₂S bLS data for corrals.

Parameter	Acceptance Criteria
Monin-Obukov Length	Abs[>2 m]
Friction velocity (u*)	> 0.15 m/s
St dev of wind direction	< 30°
Touchdown fraction	> 0.1

B.2.2 Acceptance Criteria of Post-2012 Data Sets

For bLS NH₃, increasing the touchdown fraction from > 0.1 to > 0.2 and revising the background concentration from a range to < 0.15 ppmv, as described in Grant and Boehm (2020), increases the number of available bLS NH₃ emissions records for IN5A (+ 225 records) and WI5A (+ 278 records). EPA assumed that the standard deviation of wind speed criteria remained < 30° (Grant and Boehm 2020 does not mention this criteria).

For bLS H₂S, reducing the touchdown fraction from > 0.1 to > 0.05 and revising the background concentration from a range to < 3.4 ppbv for WA5A, as described in Grant and Boehm (2015), decreases the number of available bLS H₂S emissions records for WA5A (- 55 records).

For bLS NH₃, increasing the Monin-Obukov length from Abs[>2 m] to Abs[>4 m] and the touchdown fraction from > 0.1 to > 0.4, and using 17 µg/m³ as the background concentration criteria, as described in Grant, et al. (2020), decreases the number of available bLS NH₃ emissions records for TX5A (- 747 records).

B.2.2.1 NH₃ Emissions from Lagoons/Basins

Table B-15 presents the bLS NH₃ acceptance criteria applied by the NAEMS PI to the 2012 dairy lagoon/basin data sets of 30-minute emissions values and the revised acceptance criteria provided by EPA.

Table B-15. Dairy Lagoon/Basin Acceptance Criteria for the 2012 bLS NH₃ 30-Minute Emissions Values.

Parameter	Value	
	2012 Data Set	EPA Revised
Touchdown (TD) fraction	> 0.1	> 0.2
Background concentration (Cbg)	-0.1 < Cbg < 0.1	Cbg < 0.15
Standard deviation of wind direction (sigma-dir)	< 30	No change.
Friction velocity (u*)	> 0.15	No change.

Table B-16 presents the number of 30-minute bLS NH₃ emissions flux values available after applying the revised set of acceptance criteria shown in Table 2-1.

Table B-16. Number of Available 30-Minute bLS NH₃ Emissions Flux Values Based on the 2012 and Revised Acceptance Criteria.

NAEMS Site	2012 Data Set	EPA Revised	Difference
IN5A	6,753	6,781	28
WA5A	153	269	116
WI5A	1,832	2,044	212

B.2.2.2 H₂S Emissions from Lagoons/Basins

Table B-17 presents the bLS H₂S acceptance criteria applied by the NAEMS PI to the 2012 dairy lagoon/basin data sets of 30-minute emissions values and the revised acceptance criteria provided by EPA.

Table B-17. Dairy Lagoon/Basin Acceptance Criteria for the 2012 bLS H₂S 30-Minute Emissions Values.

Parameter	Value	
	2012 Data Set	EPA Revised
TD fraction	> 0.1	> 0.05
Cbg	This parameter was not explicitly applied as an acceptance criterion in the 2012 data sets.	Cbg < 3.4
Sigma-dir	< 30	No change.
Wind direction attack angle (WD-Perp)	This parameter was not explicitly applied as an acceptance criterion in the 2012 data sets.	< 60
u*	> 0.15 ^a	No change.

^a The data header in the 2012 data sets says "<" rather than ">".

Table B-18 presents the number of 30-minute bLS H₂S emissions flux values available after applying the revised set of acceptance criteria shown in Table B-17.

Table B-18. Number of Available 30- Minute bLS H₂S Emissions Flux Values Based on the 2012 and Revised Acceptance Criteria.

NAEMS Site	2012 Data Set	EPA Revised	Difference
IN5A	5,338	4,668	-670
WA5A	501	407	-94
WI5A	1,658	1,099	-559

B.2.2.3 NH₃ Emissions from Corrals

Table B-19 presents the bLS NH₃ acceptance criteria applied by the NAEMS PI to the 2012 dairy corral data set of 30-minute emissions values and the revised acceptance criteria provided by EPA.

Table B-20 presents the number of 30-minute bLS NH₃ emissions flux values available after applying the revised set of acceptance criteria shown in Table B-19.

Table B-19. Dairy Corral Acceptance Criteria for the 2012 bLS NH₃ 30-Minute Emissions.

Parameter	Value	
	2012 Data Set	EPA Revised
TD fraction	> 0.1	> 0.4
Cbg	N/A ^a	N/A
Sigma-dir	< 30	No change.
u*	> 0.15 ^b	No change.
M-O Length (absolute value)	> 2	> 4
Sigw homogeneity fraction (σ_w)	This parameter was not explicitly applied as an acceptance criterion in the 2012 data set.	< 0.4

^a The Cbg criteria for NH₃ at TX5A is not applicable (N/A) because all values in the NAEMS data set provided to EPA are 0.

^b The data header in the 2012 data sets says "<" rather than ">".

Table B-20. Number of Available 30-Minute bLS NH₃ Emissions Flux Values Based on the 2012 and Revised Acceptance Criteria.

Site	2012 Data Set	EPA Revised	Difference
TX5A	4,671	3,724	-947

B.2.2.4 H₂S Emissions from Corrals

Table B-21 presents the bLS H₂S acceptance criteria applied by the NAEMS PI to the 2012 dairy corral data set of 30-minute emissions values and the revised acceptance criteria provided by EPA.

Table B-21. Dairy Corral Acceptance Criteria for the 2012 bLS H₂S 30-Minute Emissions Values.

Parameter	Value	
	2012 Data Set	EPA Revised
TD fraction	> 0.1	> 0.05
Cbg	N/A ^a	N/A
Sigma-dir	< 30	No change.
u*	> 0.15 ^b	No change.
WD-Perp	This parameter was not explicitly applied as an acceptance criterion in the 2012 data set.	< 60
M-O Length (absolute value)	> 2	> 4
σ_w	This parameter was not explicitly applied as an acceptance criterion in the 2012 data set.	< 0.4

^a The Cbg criteria for NH₃ at TX5A is not applicable (N/A) because all values in the NAEMS data set provided to EPA are 0.

^b The data header in the 2012 data sets says “<” rather than “>”.

Table B-22 presents the number of 30-minute bLS H₂S emissions flux values available after applying the revised set of acceptance criteria shown in Table B-21.

Table B-22. Number of Available 30-Minute bLS H₂S Emissions Flux Values Based on the 2012 and Revised Acceptance Criteria.

Site	2012 Data Set	EPA Revised	Difference
TX5A	3,028	3,033	5

B.2.3 Calculation of Average Daily Values

To prepare the 2012 NAEMS data sets of 30-minute values for use in calculating daily averages, EPA adjusted the bLS NH₃ values for sites IN5A and WI5A by multiplying the emissions values by 1.19 (Grant & Boehm 2020) and 1.13 (Grant & Boehm 2020), respectively. Adjustments factors were not provided in literature for the bLS NH₃ values for the WA5A and TX5A sites. In cases where 30-minute emissions flux values were available for both the bLS model and VRPM, we used the average of the bLS and VRPM values. Table B-23 presents an example calculation for two days at site IN5A (one day with both bLS and VRPM data, and one day with data from only measurement methodology).

Table B-23. Example Calculation of Average NH3 Emissions for IN5A.

Date and Time	Emissions Flux Data Values (g/s)			Average of VRPM and Adjusted bLS 30-min Values (g/s)
	2012 NAEMS		Adjusted	
	VRPM	bLS	bLS	
9/30/08 12:15 AM	0.450	0.630	0.750	0.600
9/30/08 12:45 AM	0.410	0.491	0.584	0.497
9/30/08 1:15 AM	0.420	0.474	0.564	0.492
9/30/08 4:15 AM	0.130	0.014	0.017	0.073
9/30/08 4:45 AM		0.064	0.076	0.076
9/30/08 6:15 AM	0.080	0.027	0.032	0.056
9/30/08 6:45 AM		0.040	0.047	0.047
9/30/08 7:15 AM		0.002	0.002	0.002
9/30/08 12:15 PM		0.037	0.044	0.044
9/30/08 12:45 PM		0.038	0.045	0.045
9/30/08 1:15 PM	0.110	0.090	0.107	0.108
9/30/08 1:45 PM	0.160	0.125	0.149	0.154
9/30/08 2:15 PM	0.130	0.139	0.165	0.148
9/30/08 2:45 PM	0.200	0.213	0.253	0.227
9/30/08 3:15 PM	0.140	0.166	0.198	0.169
9/30/08 4:15 PM	0.190	0.179	0.213	0.202
9/30/08 4:45 PM	0.190	0.169	0.201	0.196
9/30/08 5:15 PM	0.250	0.239	0.284	0.267
9/30/08 5:45 PM	0.240	0.236	0.281	0.260
9/30/08 6:45 PM	0.270	0.199	0.237	0.253
9/30/08 7:15 PM	0.350	0.341	0.406	0.378
9/30/08 7:45 PM		0.308	0.367	0.367
9/30/08 8:15 PM	0.370	0.560	0.666	0.518
9/30/08 9:15 PM		0.478	0.569	0.569
9/30/08 9:45 PM		0.553	0.658	0.658
9/30/08 10:15 PM	0.340	0.380	0.452	0.396
9/30/08 10:45 PM	0.370	0.479	0.570	0.470
9/30/08 11:45 PM	0.190	0.153	0.182	0.186
2/1/09 12:45 AM		0.115	0.137	0.137
2/1/09 1:15 AM		0.111	0.132	0.132
2/1/09 1:45 AM		0.071	0.085	0.085
2/1/09 2:15 AM		0.121	0.144	0.144
2/1/09 3:15 AM		0.113	0.134	0.134
2/1/09 3:45 AM		0.127	0.151	0.151
2/1/09 4:15 AM		0.111	0.132	0.132
2/1/09 4:45 AM		0.094	0.111	0.111
2/1/09 5:15 AM		0.137	0.163	0.163
2/1/09 5:45 AM		0.129	0.154	0.154
2/1/09 6:15 AM		0.154	0.183	0.183
2/1/09 6:45 AM		0.109	0.130	0.130
2/1/09 7:15 AM		0.098	0.117	0.117

Table B-23. Example Calculation of Average NH3 Emissions for IN5A.

Date and Time	Emissions Flux Data Values (g/s)			Average of VRPM and Adjusted bLS 30-min Values (g/s)
	2012 NAEMS		Adjusted	
	VRPM	bLS	bLS	
2/1/09 7:45 AM		-0.006	-0.007	-0.007
2/1/09 8:15 AM		0.073	0.087	0.087
2/1/09 9:15 AM		0.085	0.101	0.101
2/1/09 9:45 AM		0.076	0.091	0.091
2/1/09 10:15 AM		0.051	0.060	0.060
2/1/09 10:45 AM		0.028	0.033	0.033
2/1/09 11:15 AM		0.013	0.015	0.015
2/1/09 11:45 AM		0.017	0.020	0.020
2/1/09 4:15 PM		0.032	0.038	0.038
2/1/09 5:15 PM		0.013	0.016	0.016
2/1/09 5:45 PM		0.004	0.005	0.005
2/1/09 6:45 PM		-0.003	-0.003	-0.003
2/1/09 7:15 PM		0.007	0.009	0.009
2/1/09 7:45 PM		-0.020	-0.024	-0.024
2/1/09 8:15 PM		-0.004	-0.005	-0.005
2/1/09 9:15 PM		-0.012	-0.014	-0.014
2/1/09 10:15 PM		-0.002	-0.003	-0.003
2/1/09 10:45 PM		-0.011	-0.012	-0.012
2/1/09 11:15 PM		0.003	0.004	0.004
2/1/09 11:45 PM		0.020	0.024	0.024

B.3 References

Grant, R. H., Boehm, M. T., & Lawrence, A. F. (2013). Comparison of a backward-Lagrangian stochastic and vertical radial plume mapping methods for estimating animal waste lagoon emissions. *Agricultural and Forest Meteorology*, 180, 236-248. doi:10.1016/j.agrformet.2013.06.013

Grant, R. H., & Boehm, M. T. (2015). Manure ammonia and hydrogen sulfide emissions from a Western dairy storage basin. *J Environ Qual*, 44(1), 127-136. doi:10.2134/jeq2014.05.0196

Grant, R. H., & Boehm, M. T. (2020). Ammonia Emissions from Differing Manure Storage Facilities at Two Midwestern Free-Stall Dairies. *Atmosphere*, 11(10), 1108. doi:10.3390/atmos11101108

Grant, R. H., Boehm, M. T., & Hagevoort, G. R. (2020). Ammonia Emissions from a Western Open-Lot Dairy. *Atmosphere*, 11(9), 913. doi:10.3390/atmos11090913

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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C.1.1 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 NH₃ emissions were modeled from swine lagoons based on NAEMS data, investigated data completeness and associated accuracy. The swine lagoon NH₃ 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 $\pm 25\%$ to be acceptable and determined that a daily data completeness of 52% (or 25 out of 48 30-minute periods) gave less than $\pm 25\%$ 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.

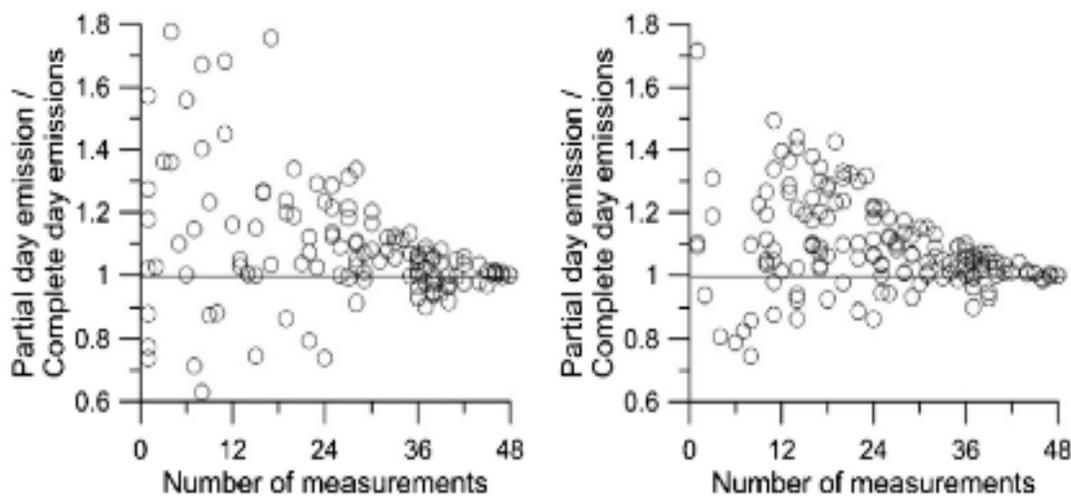


Figure C-1. Ratio of mean predicted emissions for portion of day with valid emissions measurements to mean predicted emissions for the complete day at the finishing (A) and sow (B) farm. Error plotted against number of valid 30-minute measurements (from Grant et al. 2013)

C.1.2 Data Completeness Review and Conclusions for Mechanically Ventilated Barns

The number of average daily means (ADM) for NH₃ emissions at varying percentages of data completeness for the revised data set are shown in Table C-1. For the mechanically ventilated site data set, decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 397 (16.66 %). A summary of the ADM available for H₂S is provided in Table C-2. For H₂S a shift to 50% completeness criteria would increase the ADM available by 391, a 14.66% increase. For the particulate matter size fractions, PM₁₀ (Table C-3) would increase by 338 (18.73%), PM_{2.5} (Table C-4) would increase by 29 (13.94%) and TSP (Table C-5) would increase by 99 (28.86%).

Based on the Grant et al. (2013) study there would be an approximate 15% increase in error with the shift to 50% completeness criteria. Since the small increase in the number of ADM values for mechanically ventilated barns does not justify the 15% increase in error, a daily completeness criterion of 75% was chosen for the revised mechanically ventilated data set.

Table C-1. The number of mechanically ventilated barn ADM for NH₃ at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B B1	606	599	596	582	566	552	522	486	467	436	422	344
IN5B B2	613	608	605	592	578	562	530	495	478	446	434	356
NY5B B1	442	440	435	420	410	399	382	360	350	336	296	90
WI5B B1	697	696	692	682	664	641	613	585	564	549	525	314
WI5B B2	710	705	696	682	658	626	593	549	524	498	448	190
Total	3068	3048	3024	2958	2876	2780	2640	2475	2383	2265	2125	1294

Table C-2. The number of mechanically ventilated barn ADM for H₂S at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B B1	638	634	629	616	596	586	566	540	521	489	477	388
IN5B B2	657	652	650	639	625	616	597	567	552	521	510	412
NY5B B1	608	603	646	578	567	546	516	480	467	443	392	140
WI5B B1	718	716	713	706	686	661	634	607	582	565	538	319
WI5B B2	732	725	717	703	680	649	616	572	545	518	465	198
Total	3353	3330	3355	3242	3154	3058	2929	2766	2667	2536	2382	1457

Table C-3. The number of mechanically ventilated barn ADM for PM₁₀ at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B B1	474	463	455	449	435	415	393	371	367	364	343	232
IN5B B2	426	422	414	409	398	379	365	351	348	339	323	205
NY5B B1	496	491	492	471	454	431	397	343	328	303	240	43
WI5B B1	534	528	526	516	500	469	437	416	400	391	359	181
WI5B B2	531	523	519	504	484	449	416	383	362	348	305	104
Total	2461	2427	2406	2349	2271	2143	2008	1864	1805	1745	1570	765

Table C-4. The number of mechanically ventilated barn 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
IN5B B1	42	41	39	36	33	32	31	29	28	27	27	22
IN5B B2	44	41	39	39	35	32	32	30	29	29	29	21
NY5B B1	70	69	68	66	65	60	56	56	53	52	43	1
WI5B B1	68	67	66	65	62	59	56	54	53	53	49	26
WI5B B2	67	66	64	60	56	54	47	47	45	45	42	16
Total	291	284	276	266	251	237	222	216	208	206	190	86

Table C-5. The number of mechanically ventilated barn ADM for TSP at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B B1	105	104	102	99	93	86	77	77	77	77	74	57
IN5B B2	90	89	87	86	83	76	68	67	67	67	66	47
NY5B B1	62	61	89	59	54	77	48	42	41	37	35	12
WI5B B1	118	118	118	117	111	100	95	86	82	81	75	38
WI5B B2	130	130	126	124	118	103	87	78	76	73	59	22
Total	505	502	522	485	459	442	375	350	343	335	309	176

C.1.3 Data Completeness Review and Conclusions for Naturally Ventilated Barns

The number of ADM of NH₃ for the naturally ventilated barn revised data set are shown in Table C-6. The table shows decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 630 (98.75 %). For H₂S (Table C-7), a shift to 50% completeness would increase ADM to 680, a 97.00% increase. For the particulate matter size fractions, PM₁₀ (Table C-8) would increase by 108 (4.87%), PM_{2.5} (Table C-9) by 7 (4.00%) and TSP (Table C-10) by 28 (13.59%).

EPA considered shifting the completeness criteria to 50% for the naturally ventilated barns. However, concerns about data quality at both CA5B and WA5B led to questions on whether the approximate 15% increase in error suggested by the Grant et al. (2013) study would

hold for these sources or introduce more additional error. EPA elected to leave the completeness criteria at 75% at this time and will revisit prior to the finalization of the emission models.

Table C-6. The number of naturally ventilated barn ADM for NH₃ at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
CA5B B1	524		486		399	349	282		191	160		9
CA5B B2	557		516		431	381	316		223	188		8
WA5B B2	562	504	458	410	359	294	270	158	125	96	43	1
WA5B B4	454	398	368	336	290	244	226	124	99	73	34	2
Total	2097	902	1828	746	1479	1268	1094	282	638	517	77	20

Table C-7. The number of naturally ventilated barn ADM for H₂S at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
CA5B B1	550		510		420	367	296		212	175		9
CA5B B2	625		582		497	443	372		269	227		9
WA5B B2	626	545	501	449	385	314	283	158	116	87	41	1
WA5B B4	518	439	404	369	324	257	229	128	104	73	37	2
Total	2319	984	1997	818	1626	1381	1180	286	701	562	78	21

Table C-8. The number of naturally ventilated barn ADM for PM₁₀ at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
CA5B B1	563		560		553	547	531		520	517		332
CA5B B2	491		488		478	470	457		451	448		284
WA5B B2	513	513	511	506	499	482	466	455	452	450	447	373
WA5B B4	482	481	479	473	463	450	433	421	418	417	416	340
Total	2049	994	2038	979	1993	1949	1887	876	1841	1832	863	1329

Table C-9. The number of naturally ventilated 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
CA5B B1	60		57		52	48	48		47	46		27
CA5B B2	68		64		58	56	54		54	53		35
WA5B B2	44	43	43	42	42	39	38	37	37	37	37	32
WA5B B4	44	43	43	42	42	39	38	37	37	37	37	26
Total	216	86	207	84	194	182	178	74	175	173	74	120

Table C-10. The number of naturally ventilated barn ADM for TSP at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
CA5B B1	88		85		82	81	75		71	71		49
CA5B B2	76		72		71	69	63		59	59		38
WA5B B2	53	52	52	52	51	42	39	38	38	38	37	34
WA5B B4	53	52	52	52	52	42	39	38	38	38	37	33
Total	270	104	261	104	256	234	216	76	206	206	74	154

C.1.4 Data Completeness Review and Conclusions for Milking Centers

The number of ADM for NH₃ emissions for the milking center revised data set at varying percentages of data completeness are shown in Table C-11. Decreasing the daily completeness criteria from 75% to 50% would increase the number of valid days by 74 (10.24 %) for NH₃. Similarly, shifting to 50% completeness criteria would increase H₂S (Table C-12) ADM by 80 (8.41%), PM₁₀ (Table C-13) by 43 (9.82%), PM_{2.5} (Table C-14) by 4 (9.09%), and TSP (Table C-15) by 9 (21.43%). EPA decide the modest increases in available ADM obtained by decreasing the completeness criteria to 50% did not justify the approximate 15% increase in error estimated by the Grant et al. (2013) study. Therefore, a daily completeness criterion of 75% was chosen for the milking center data set.

Table C-11. The number of milking centers ADM for NH₃ at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B MC	423	422	420	414	402	387	373	350	338	301	300	259
NY5B MC	432	430	430	427	419	410	404	393	385	381	358	153
Total	855	852	850	841	821	797	777	743	723	682	658	412

Table C-12. The number of milking centers ADM for H₂S at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B MC	480	479	477	474	463	447	434	412	400	368	366	317
NY5B MC	608	606	654	601	592	584	576	562	551	545	520	225
Total	1088	1085	1131	1075	1055	1031	1010	974	951	913	886	542

Table C-13. The number of milking centers ADM for PM₁₀ at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B MC												
NY5B MC	510	507	511	499	490	481	465	448	438	431	400	148
Total	510	507	511	499	490	481	465	448	438	431	400	148

Table C-14. The number of milking centers 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
IN5B MC												
NY5B MC	50	50	50	49	48	48	44	44	44	44	43	6
Total	50	50	50	49	48	48	44	44	44	44	43	6

Table C-15. The number of milking centers ADM for TSP at varying percentages of data completeness.

% Valid Data	0	10	20	30	40	50	60	70	75	80	90	100
IN5B MC												
NY5B MC	61	61	89	59	53	51	49	43	42	40	36	15
Total	61	61	89	59	53	51	49	43	42	40	36	15

C.1.5 Data Completeness Review and Conclusions for Open Sources

For lagoons and basins, the number of ADM for NH₃ (Table C-16) increased by 84 (118%) when considering the combined bLS and VRPM dataset. For H₂S (Table C-17), where there are only bLS estimates, the number of ADM increased by 56 (266%) when looking at all three sites combined. For corrals (Table C-18), the number of NH₃ ADM increased by 41 (66.13%) and H₂S ADM increased to 25 (119.05%) when shifting to 52% completeness criteria. For all the open sources, EPA concluded the increases in available ADM obtained by decreasing the completeness criteria to 52% did justify the approximate 15% increase in error estimated by the Grant et al. (2013) study. Therefore, a daily completeness criterion of 52% was chosen for all the open source types.

Table C-16. The number of lagoon and basin ADM for NH₃ at varying percentages of data completeness.

Percent Completeness	ADM by NAEMS Site								
	IN5A			WA5A			WI5A		
	bLS	VRPM	bLS or VRPM	bLS	VRPM	bLS or VRPM	bLS	VRPM	bLS or VRPM
0%	281	215	283	42	58	71	113	77	124
52%	110	71	131	0	2	2	22	1	22
75%*	49	18	59	0	0	0	12	1	12

Table C-17. The number of lagoon and basin ADM for H₂S at varying percentages of data completeness.

Percent Completeness	ADM by NAEMS Site		
	IN5A	WA5A	W15A
0%	303	61	77
52%	59	1	17
75%*	17	0	4

Table C-18. The number of corral ADM for NH₃ at varying percentages of data completeness.

Percent Completeness	NH ₃	H ₂ S
0%	163	140
52%	103	46
75%*	62	21

C.2 Reference

Grant, R.H., Boehm, M.T., Lawrence, A.F., & Heber, A.J. (2013). Ammonia emissions from anaerobic treatment lagoons at sow and finishing farms in Oklahoma. *Agricultural and Forest Meteorology* 180, 203-210

Appendix D: Summary Statistics

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1 Mechanically Ventilated Barns

1.1 Emissions

1.1.1 Ammonia (NH₃)

Table 1.1: NH₃ emission summary statistics for dairy mechanically ventilated barns (kg d⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	40.3	40	21.7	8.6	11.2
StdDev	25.3	24	8.1	2.8	4.6
Median	33.7	34	20.2	8.2	10.7
Minimum	3.4	3	6.8	3.8	3.4
Maximum	122.6	120	45.3	19.1	26.6
CV	62.6	61	37.3	33.0	40.6
N>0	467.0	478	350.0	564.0	524.0
Q25	20.9	20	15.1	6.6	7.6
Q75	59.6	57	27.4	10.3	14.1

Table 1.2: NH₃ emission summary statistics for dairy mechanically ventilated barns (kg d⁻¹ hd⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	48.3	46.0	46	41	31.4
StdDev	30.0	27.9	17	15	12.2
Median	40.3	39.3	43	39	30.3
Minimum	4.3	3.7	14	18	9.9
Maximum	142.9	140.2	99	103	70.6
N	467.0	478.0	348	564	524.0
N>0	467.0	478.0	348	564	524.0
	0.0	0.0	2	0	0.0
Q25	25.2	23.6	33	31	21.8
Q75	71.5	65.4	58	49	39.4
CV	62.2	60.6	38	36	38.9

1.1.2 Hydrogen Sulfide (H₂S)

Table 1.3: H₂S emission summary statistics for dairy mechanically ventilated barns (g d⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	758	1074	524	1045	871
StdDev	950	1502	431	1296	1077
Median	237	484	379	386	244
Minimum	-80	-94	34	-15	-66
Maximum	5810	11093	2184	8195	5312
CV	125	140	82	124	124
N<0	40	21	0	3	4
Q25	50	87	165	68	77
Q75	1411	1535	816	1655	1478

Table 1.4: H₂S emission summary statistics for dairy mechanically ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	902	1235	1118	4960	2452
StdDev	1123	1717	918	6137	3035
Median	283	557	817	1803	677
Minimum	-100	-110	73	-69	-186
Maximum	6685	12606	4810	38839	14963
CV	124	139	82	124	124
N<0	40	21	0	3	4
Q25	60	102	348	317	216
Q75	1697	1792	1732	7842	4162

1.1.3 Particulate Matter (PM₁₀)

Table 1.5: PM₁₀ emission summary statistics for dairy mechanically ventilated barns (g d⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	121	185	229	376	574
StdDev	179	158	336	578	819
Median	79	169	74	121	173
Minimum	-30	-42	-21	-42	-11
Maximum	2070	1084	2101	3888	4554
CV	148	86	146	153	143
N<0	26	21	4	28	4
Q25	24	65	42	55	82
Q75	167	255	267	403	742

Table 1.6: PM₁₀ emission summary statistics for dairy mechanically ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	146	214	496	1814	1602
StdDev	217	182	726	2759	2285
Median	93	195	159	564	498
Minimum	-39	-51	-44	-197	-30
Maximum	2530	1266	4424	17595	12827
N	235	298	322	391	357
N<0	26	21	4	28	4
N>0	209	277	318	363	353
Q25	30	77	89	262	238
Q75	201	298	578	1993	1980
CV	149	85	146	152	143

1.1.4 Particulate Matter (PM_{2.5})

Table 1.7: PM_{2.5} emission summary statistics for dairy mechanically ventilated barns (g d⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	80	102	36.7	145	186.7
StdDev	60	72	29.8	145	203.8
Median	84	123	27.5	87	95.7
Minimum	-19	-22	-3.2	-20	-4.3
Maximum	208	207	113.8	539	805.8
CV	75	71	81.3	100	109.1
N<0	2	3	2.0	6	1.0
Q25	33	46	11.4	31	33.7
Q75	121	154	59.8	220	265.9

Table 1.8: PM_{2.5} emission summary statistics for dairy mechanically ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	98	120	77.6	677	529
StdDev	73	84	63.0	670	576
Median	103	143	60.2	424	275
Minimum	-22	-26	-6.6	-94	-13
Maximum	256	240	240.7	2428	2270
N	19	22	53.0	52	45
N<0	2	3	2.0	6	1
N>0	17	19	51.0	46	44
Q25	39	55	24.0	143	99
Q75	149	180	126.3	1005	749
CV	75	71	81.2	99	109

1.1.5 Total Suspended Particulates (TSP)

Table 1.9: TSP emission summary statistics for dairy mechanically ventilated barns (g d⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	367	329	271.8	910	879
StdDev	326	274	270.8	803	943
Median	318	267	216.5	531	451
Minimum	-80	-89	-3.7	-110	15
Maximum	1841	1226	1572.6	3303	4198
CV	89	83	99.6	88	107
N<0	6	2	1.0	2	0
Q25	110	128	153.6	316	255
Q75	538	437	289.2	1663	1174

Table 1.10: TSP emission summary statistics for dairy mechanically ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Mean	447	385	579	4487	2436
StdDev	397	318	576	4055	2600
Median	392	325	468	2816	1290
Minimum	-94	-101	-8	-523	42
Maximum	2248	1411	3339	17854	11826
N	74	67	37	78	76
N<0	6	2	1	2	0
N>0	68	65	36	76	76
Q25	131	147	327	1515	702
Q75	659	519	624	8138	3170
CV	89	82	99	90	107

1.2 Environmental

Table 1.11: Environmental parameter summary statistics for dairy mechanically ventilated barns.

1	2	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Inventory (1,000 hd)	Mean	0.83	0.86	0.47	0.21	0.35
Inventory (1,000 hd)	StdDev	0.02	0.02	0.01	0.01	0.02
Inventory (1,000 hd)	Median	0.83	0.86	0.47	0.21	0.36
Inventory (1,000 hd)	Minimum	0.77	0.79	0.44	0.18	0.32
Inventory (1,000 hd)	Maximum	0.88	0.90	0.50	0.23	0.40
Inventory (1,000 hd)	N	1309.00	1420.00	1225.00	1668.00	1544.00
Inventory (1,000 hd)	Q25	0.81	0.85	0.46	0.21	0.34
Inventory (1,000 hd)	Q75	0.85	0.88	0.48	0.21	0.36
Inventory (1,000 hd)	CV	0.03	0.02	0.02	0.05	0.04
Average Weight (kg)	Mean	635.00	635.00	577.68	703.00	703.00
Average Weight (kg)	StdDev	0.00	0.00	0.80	0.00	0.00
Average Weight (kg)	Median	635.00	635.00	578.00	703.00	703.00
Average Weight (kg)	Minimum	635.00	635.00	576.00	703.00	703.00
Average Weight (kg)	Maximum	635.00	635.00	579.00	703.00	703.00
Average Weight (kg)	N	1309.00	1420.00	1225.00	1668.00	1544.00
Average Weight (kg)	Q25	635.00	635.00	577.00	703.00	703.00
Average Weight (kg)	Q75	635.00	635.00	578.00	703.00	703.00
Average Weight (kg)	CV	0.00	0.00	0.00	0.00	0.00
Live animal weight (Mg)	Mean	0.00	0.00	270.80	147.55	249.47
Live animal weight (Mg)	StdDev	0.00	0.00	6.55	7.29	10.66
Live animal weight (Mg)	Median	0.00	0.00	271.77	148.33	249.56
Live animal weight (Mg)	Minimum	0.00	0.00	251.86	128.65	227.77
Live animal weight (Mg)	Maximum	0.00	0.00	291.24	165.21	279.79
Live animal weight (Mg)	N	1309.00	1420.00	1225.00	1668.00	1544.00
Live animal weight (Mg)	Q25	0.00	0.00	267.04	148.33	242.54
Live animal weight (Mg)	Q75	0.00	0.00	275.13	149.74	249.56
Live animal weight (Mg)	CV	0.00	0.00	0.02	0.05	0.04
Exhaust Temperatures (C)	Mean	11.22	11.69	13.50	10.64	10.87
Exhaust Temperatures (C)	StdDev	8.24	7.91	6.66	8.40	8.86
Exhaust Temperatures (C)	Median	12.00	12.25	13.80	10.70	11.40
Exhaust Temperatures (C)	Minimum	-9.90	-9.20	-1.40	-6.30	-6.90
Exhaust Temperatures (C)	Maximum	26.30	26.80	28.60	25.80	26.40
Exhaust Temperatures (C)	N	1309.00	1420.00	1231.00	1668.00	1544.00
Exhaust Temperatures (C)	Q25	4.40	5.30	7.80	3.30	3.20
Exhaust Temperatures (C)	Q75	18.30	18.42	19.10	18.60	19.20
Exhaust Temperatures (C)	CV	0.73	0.68	0.49	0.79	0.82
Exhaust Relative Humidity (%)	Mean	74.76	75.03	72.81	69.83	67.19
Exhaust Relative Humidity (%)	StdDev	7.34	7.27	7.26	8.76	10.17
Exhaust Relative Humidity (%)	Median	74.50	74.80	73.70	71.00	68.10
Exhaust Relative Humidity (%)	Minimum	55.30	53.90	39.30	37.60	30.90
Exhaust Relative Humidity (%)	Maximum	89.50	88.10	86.90	85.50	87.80
Exhaust Relative Humidity (%)	N	1309.00	1420.00	1203.00	1486.00	1509.00

1	2	IN5BB1	IN5BB2	NY5BB1	WI5BB1	WI5BB2
Exhaust Relative Humidity (%)	Q25	69.40	69.77	69.30	64.60	61.10
Exhaust Relative Humidity (%)	Q75	80.90	81.60	77.20	76.10	73.80
Exhaust Relative Humidity (%)	CV	0.10	0.10	0.10	0.13	0.15
Airflow (dsm ³ s ⁻¹)	Mean	208.42	203.63	150.99	134.20	152.99
Airflow (dsm ³ s ⁻¹)	StdDev	56.39	59.50	108.80	87.57	104.91
Airflow (dsm ³ s ⁻¹)	Median	242.00	238.00	127.00	118.00	141.00
Airflow (dsm ³ s ⁻¹)	Minimum	67.70	47.00	24.20	16.90	31.00
Airflow (dsm ³ s ⁻¹)	Maximum	286.00	278.00	312.00	355.00	378.00
Airflow (dsm ³ s ⁻¹)	N	1309.00	1415.00	1150.00	1647.00	1537.00
Airflow (dsm ³ s ⁻¹)	Q25	142.00	137.00	31.47	57.10	42.50
Airflow (dsm ³ s ⁻¹)	Q75	256.00	252.00	262.00	202.00	234.00
Airflow (dsm ³ s ⁻¹)	CV	0.27	0.29	0.72	0.65	0.69

1.3 Ambient

Table 1.12: Summary of ambient meteorological parameters for dairy mechanically ventilated barns.

1	2	IN5B	NY5B	WI5B
Ambient Temperature (C)	Mean	11.63	12.24	7.09
Ambient Temperature (C)	StdDev	10.44	10.65	12.29
Ambient Temperature (C)	Median	13.50	15.20	9.00
Ambient Temperature (C)	Minimum	-22.40	-11.50	-23.50
Ambient Temperature (C)	Maximum	28.90	31.60	27.90
Ambient Temperature (C)	count	595.00	538.00	622.00
Ambient Temperature (C)	Q25	3.00	2.32	-2.25
Ambient Temperature (C)	Q75	21.00	21.28	18.10
Ambient Temperature (C)	CV	0.90	0.87	1.73
Ambient Relative Humidity (%)	Mean	67.74	68.66	68.94
Ambient Relative Humidity (%)	StdDev	8.46	10.29	11.18
Ambient Relative Humidity (%)	Median	68.60	69.60	70.00
Ambient Relative Humidity (%)	Minimum	40.70	29.40	24.40
Ambient Relative Humidity (%)	Maximum	93.00	89.90	91.70
Ambient Relative Humidity (%)	count	605.00	527.00	622.00
Ambient Relative Humidity (%)	Q25	62.00	61.90	63.12
Ambient Relative Humidity (%)	Q75	73.80	75.80	76.20
Ambient Relative Humidity (%)	CV	0.12	0.15	0.16
Wind Speed (ms ⁻¹)	Mean	3.61	1.87	2.92
Wind Speed (ms ⁻¹)	StdDev	1.82	1.01	1.25
Wind Speed (ms ⁻¹)	Median	3.19	1.59	2.72
Wind Speed (ms ⁻¹)	Minimum	0.12	0.08	0.29
Wind Speed (ms ⁻¹)	Maximum	11.20	6.64	7.78
Wind Speed (ms ⁻¹)	count	648.00	529.00	668.00
Wind Speed (ms ⁻¹)	Q25	2.19	1.20	2.01
Wind Speed (ms ⁻¹)	Q75	4.70	2.14	3.67
Wind Speed (ms ⁻¹)	CV	0.50	0.54	0.43

2 Milking Centers

2.1 Emissions

2.1.1 Ammonia (NH₃)

Table 2.1: NH₃ emission summary statistics for dairy milking centers (kg d⁻¹).

Statistic	IN5BMC	NY5BMC
Mean	8.81	5.8
StdDev	7.35	2.1
Median	7.36	5.7
Minimum	-0.66	1.3
Maximum	35.89	13.7
CV	83.48	36.0
N<0	13.00	0.0
Q25	2.37	4.3
Q75	14.26	6.9

Table 2.2: NH₃ emission summary statistics for dairy milking centers (kg d⁻¹ hd⁻¹).

Statistic	IN5BMC	NY5BMC
Mean	15.7	30.3
StdDev	13.1	10.9
Median	13.1	29.9
Minimum	-1.2	6.7
Maximum	63.9	72.1
N	338.0	385.0
N<0	13.0	0.0
N>0	325.0	385.0
Q25	4.2	22.7
Q75	25.4	36.5
CV	83.5	36.0

2.1.2 Hydrogen Sulfide (H₂S)

Table 2.3: H₂S emission summary statistics for dairy milking centers (g d⁻¹).

Statistic	IN5BMC	NY5BMC
Mean	1347	129.5
StdDev	2179	113.0
Median	505	92.1
Minimum	-33	7.2
Maximum	17787	628.8
CV	162	87.3
N<0	42	0.0
Q25	39	46.0
Q75	1993	170.7

Table 2.4: H₂S emission summary statistics for dairy milking centers (mg d⁻¹ hd⁻¹).

Statistic	IN5BMC	NY5BMC
Mean	2398	682
StdDev	3878	595
Median	898	485
Minimum	-59	38
Maximum	31649	3310
CV	162	87
N<0	42	0
Q25	69	242
Q75	3546	898

2.1.3 Particulate Matter (PM₁₀)

Table 2.5: PM₁₀ emission summary statistics for dairy milking centers (g d⁻¹).

Statistic	NY5BMC
Mean	90.7
StdDev	72.8
Median	65.6
Minimum	-1.4
Maximum	484.5
CV	80.3
N<0	1.0
Q25	42.0
Q75	113.7

Table 2.6: PM₁₀ emission summary statistics for dairy milking centers (mg d⁻¹ hd⁻¹).

Statistic	NY5BMC
Mean	477.3
StdDev	383.1
Median	345.5
Minimum	-7.5
Maximum	2550.0
N	436.0
N<0	1.0
N>0	435.0
Q25	220.8
Q75	598.2
CV	80.3

2.1.4 Particulate Matter (PM_{2.5})

Table 2.7: PM_{2.5} emission summary statistics for dairy milking centers (g d⁻¹).

Statistic	NY5BMC
Mean	26.6
StdDev	27.5
Median	23.7
Minimum	2.8
Maximum	188.8
CV	103.5
N>0	44.0
Q25	13.5
Q75	29.5

Table 2.8: PM_{2.5} emission summary statistics for dairy milking centers (mg d⁻¹ hd⁻¹).

Statistic	NY5BMC
Mean	140
StdDev	145
Median	125
Minimum	15
Maximum	993
N	44
N>0	44
Q25	71
Q75	155
CV	104

2.1.5 Total Suspended Particulates (TSP)

Table 2.9: TSP emission summary statistics for dairy milking centers (g d⁻¹).

Statistic	NY5BMC
Mean	124.73
StdDev	89.02
Median	101.04
Minimum	-0.67
Maximum	321.67
CV	71.37
N<0	1.00
Q25	59.39
Q75	185.32

Table 2.10: TSP emission summary statistics for dairy milking centers (mg d⁻¹ hd⁻¹).

Statistic	NY5BMC
Mean	656.5
StdDev	468.5
Median	531.8
Minimum	-3.5
Maximum	1693.0
N	40.0
N<0	1.0
N>0	39.0
Q25	312.6
Q75	975.4
CV	71.4

2.2 Environmental

Table 2.11: Environmental parameter summary statistics for dairy milking centers.

1	2	IN5BMC	NY5BMC
Inventory (1,000 hd)	Mean	0.56	0.19
Inventory (1,000 hd)	StdDev	0.00	0.00
Inventory (1,000 hd)	Median	0.56	0.19
Inventory (1,000 hd)	Minimum	0.56	0.19
Inventory (1,000 hd)	Maximum	0.56	0.19
Inventory (1,000 hd)	N	726.00	1456.00
Inventory (1,000 hd)	Q25	0.56	0.19
Inventory (1,000 hd)	Q75	0.56	0.19
Inventory (1,000 hd)	CV	0.00	0.00
Average Weight (kg)	Mean	72.00	577.68
Average Weight (kg)	StdDev	0.00	0.79
Average Weight (kg)	Median	72.00	578.00
Average Weight (kg)	Minimum	72.00	576.00
Average Weight (kg)	Maximum	72.00	580.00
Average Weight (kg)	N	726.00	1452.00
Average Weight (kg)	Q25	72.00	577.00
Average Weight (kg)	Q75	72.00	578.00
Average Weight (kg)	CV	0.00	0.00
Live animal weight (Mg)	Mean	40.46	109.76
Live animal weight (Mg)	StdDev	0.00	0.15
Live animal weight (Mg)	Median	40.46	109.82
Live animal weight (Mg)	Minimum	40.46	109.44
Live animal weight (Mg)	Maximum	40.46	110.20
Live animal weight (Mg)	N	726.00	1452.00
Live animal weight (Mg)	Q25	40.46	109.63
Live animal weight (Mg)	Q75	40.46	109.82
Live animal weight (Mg)	CV	0.00	0.00
Exhaust Temperatures (C)	Mean	15.55	13.73
Exhaust Temperatures (C)	StdDev	6.37	6.56
Exhaust Temperatures (C)	Median	17.25	14.00
Exhaust Temperatures (C)	Minimum	-0.20	-1.90
Exhaust Temperatures (C)	Maximum	27.10	28.80
Exhaust Temperatures (C)	N	726.00	1456.00
Exhaust Temperatures (C)	Q25	11.80	7.80
Exhaust Temperatures (C)	Q75	20.30	19.20
Exhaust Temperatures (C)	CV	0.41	0.48
Exhaust Relative Humidity (%)	Mean	74.41	73.22
Exhaust Relative Humidity (%)	StdDev	11.03	8.26
Exhaust Relative Humidity (%)	Median	76.50	73.70
Exhaust Relative Humidity (%)	Minimum	41.10	30.70
Exhaust Relative Humidity (%)	Maximum	92.20	89.40
Exhaust Relative Humidity (%)	N	710.00	1146.00
Exhaust Relative Humidity (%)	Q25	67.03	69.40

1	2	IN5BMC	NY5BMC
Exhaust Relative Humidity (%)	Q75	83.70	78.80
Exhaust Relative Humidity (%)	CV	0.15	0.11
Airflow (dsm ³ s ⁻¹)	Mean	187.46	42.93
Airflow (dsm ³ s ⁻¹)	StdDev	39.73	26.64
Airflow (dsm ³ s ⁻¹)	Median	200.00	37.30
Airflow (dsm ³ s ⁻¹)	Minimum	74.10	7.30
Airflow (dsm ³ s ⁻¹)	Maximum	241.00	84.40
Airflow (dsm ³ s ⁻¹)	N	633.00	1456.00
Airflow (dsm ³ s ⁻¹)	Q25	159.00	16.50
Airflow (dsm ³ s ⁻¹)	Q75	221.00	73.40
Airflow (dsm ³ s ⁻¹)	CV	0.21	0.62

2.3 Ambient

Table 2.12: Summary of ambient meteorological parameters for dairy milking centers.

1	2	IN5B	NY5B
Ambient Temperature (C)	Mean	14.65	11.80
Ambient Temperature (C)	StdDev	8.90	9.80
Ambient Temperature (C)	Median	17.80	12.80
Ambient Temperature (C)	Minimum	-11.50	-10.80
Ambient Temperature (C)	Maximum	29.00	31.60
Ambient Temperature (C)	count	430.00	611.00
Ambient Temperature (C)	Q25	9.03	3.40
Ambient Temperature (C)	Q75	21.70	20.35
Ambient Temperature (C)	CV	0.61	0.83
Ambient Relative Humidity (%)	Mean	66.68	67.92
Ambient Relative Humidity (%)	StdDev	8.36	10.72
Ambient Relative Humidity (%)	Median	67.65	69.15
Ambient Relative Humidity (%)	Minimum	40.70	29.40
Ambient Relative Humidity (%)	Maximum	93.00	91.80
Ambient Relative Humidity (%)	count	430.00	596.00
Ambient Relative Humidity (%)	Q25	60.65	61.20
Ambient Relative Humidity (%)	Q75	72.57	75.40
Ambient Relative Humidity (%)	CV	0.13	0.16
Wind Speed (ms ⁻¹)	Mean	3.36	1.98
Wind Speed (ms ⁻¹)	StdDev	1.69	1.06
Wind Speed (ms ⁻¹)	Median	2.87	1.70
Wind Speed (ms ⁻¹)	Minimum	0.77	0.08
Wind Speed (ms ⁻¹)	Maximum	8.88	6.64
Wind Speed (ms ⁻¹)	count	431.00	607.00
Wind Speed (ms ⁻¹)	Q25	2.06	1.27
Wind Speed (ms ⁻¹)	Q75	4.32	2.41
Wind Speed (ms ⁻¹)	CV	0.50	0.54

3 Naturally Ventilated Barns

3.1 Emissions

3.1.1 Ammonia (NH₃)

Table 3.1: NH₃ emission summary statistics for naturally ventilated barns (kg d⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	3.6	3.3	29.09	55
StdDev	3.6	3.2	21.81	32
Median	3.2	2.8	22.06	45
Minimum	-1.5	-1.7	0.52	9
Maximum	21.2	15.4	96.60	171
CV	98.8	96.0	74.98	58
N<0	20.0	28.0	0.00	0
Q25	1.1	1.0	13.92	32
Q75	5.3	4.9	38.32	71

Table 3.2: NH₃ emission summary statistics for naturally ventilated barns (kg d⁻¹ hd⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	6.9	5.9	57	56.5
StdDev	6.6	5.7	43	33.2
Median	6.3	5.3	42	48.0
Minimum	-3.0	-3.1	1	9.5
Maximum	36.9	28.8	189	174.2
N	174.0	209.0	123	99.0
N<0	20.0	28.0	0	0.0
N>0	154.0	181.0	123	99.0
Q25	2.1	1.8	26	33.3
Q75	10.2	8.9	75	72.5
CV	95.7	95.3	76	58.8

3.1.2 Hydrogen Sulfide (H₂S)

Table 3.3: H₂S emission summary statistics for naturally ventilated barns (g d⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	607	679	983	2159
StdDev	571	506	1520	3002
Median	625	685	399	1190
Minimum	-272	-334	-364	-325
Maximum	3775	2645	6514	17960
CV	94	74	155	139
N<0	23	16	25	7
Q25	170	320	-31	421
Q75	852	930	1332	2490

Table 3.4: H₂S emission summary statistics for naturally ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	1195	1226	1914	2208
StdDev	1140	924	2968	3028
Median	1206	1260	765	1263
Minimum	-525	-576	-712	-342
Maximum	7345	4827	12722	17889
CV	95	75	155	137
N<0	23	16	25	7
Q25	307	544	-60	440
Q75	1668	1699	2520	2546

3.1.3 Particulate Matter (PM₁₀)

Table 3.5: PM₁₀ emission summary statistics for naturally ventilated barns (g d⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	427	971	4962	11761
StdDev	893	2084	18103	24757
Median	135	209	1693	5176
Minimum	-254	-534	-855	-604
Maximum	6135	14372	353457	367744
CV	209	215	365	210
N<0	99	147	32	4
Q25	-105	-206	736	1483
Q75	563	1315	5423	13217

Table 3.6: PM₁₀ emission summary statistics for naturally ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	813	1717	9615	12178
StdDev	1687	3663	35313	26125
Median	262	388	3294	5266
Minimum	-582	-1005	-1727	-619
Maximum	11446	26763	690347	392470
N	247	377	431	408
N<0	99	147	32	4
N>0	148	230	399	404
Q25	-204	-367	1442	1524
Q75	1069	2365	10496	13625
CV	207	213	367	215

3.1.4 Particulate Matter (PM_{2.5})

Table 3.7: PM_{2.5} emission summary statistics for naturally ventilated barns (g d⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	42	235	2719	1863
StdDev	53	156	1828	1779
Median	44	217	2818	1362
Minimum	-23	-133	348	-676
Maximum	101	458	7248	6475
CV	126	67	67	95
N<0	1	1	0	6
Q25	15	148	1198	682
Q75	71	334	3632	3091

Table 3.8: PM_{2.5} emission summary statistics for naturally ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	81	396	5250	1904
StdDev	103	272	3509	1820
Median	87	360	5504	1314
Minimum	-45	-239	679	-679
Maximum	197	825	13992	6830
N	4	15	37	37
N<0	1	1	0	6
N>0	3	14	37	31
Q25	29	245	2330	669
Q75	139	579	6958	3264
CV	126	69	67	96

3.1.5 Total Suspended Particulates (TSP)

Table 3.9: TSP emission summary statistics for naturally ventilated barns (g d⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	4864	8129	19332	47389
StdDev	7254	8699	25603	71485
Median	2903	5578	8286	25605
Minimum	-973	-236	1413	4817
Maximum	45690	43350	122272	374175
CV	149	107	132	151
N<0	6	4	0	0
Q25	610	1615	4548	9331
Q75	6563	13549	25279	51922

Table 3.10: TSP emission summary statistics for naturally ventilated barns (mg d⁻¹ hd⁻¹).

Statistic	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Mean	9306	14635	37190	49100
StdDev	13727	15640	48829	74726
Median	5688	10728	16143	25775
Minimum	-2062	-425	2761	5007
Maximum	86371	81793	230702	388552
N	70	59	38	38
N<0	6	4	0	0
N>0	64	55	38	38
Q25	1212	2910	8746	8889
Q75	13263	22653	48837	54748
CV	148	107	131	152

3.2 Environmental

Table 3.11: Environmental parameter summary statistics for naturally ventilated barns.

1	2	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Inventory (1,000 hd)	Mean	0.52	0.55	0.51	0.97
Inventory (1,000 hd)	StdDev	0.04	0.03	0.01	0.05
Inventory (1,000 hd)	Median	0.51	0.56	0.51	0.97
Inventory (1,000 hd)	Minimum	0.42	0.50	0.49	0.74
Inventory (1,000 hd)	Maximum	0.59	0.61	0.53	1.06
Inventory (1,000 hd)	N	693.00	927.00	728.00	671.00
Inventory (1,000 hd)	Q25	0.49	0.53	0.51	0.95
Inventory (1,000 hd)	Q75	0.55	0.58	0.52	1.00
Inventory (1,000 hd)	CV	0.07	0.05	0.02	0.05
Average Weight (kg)	Mean	635.00	635.00	635.00	635.00
Average Weight (kg)	StdDev	0.00	0.00	0.00	0.00
Average Weight (kg)	Median	635.00	635.00	635.00	635.00
Average Weight (kg)	Minimum	635.00	635.00	635.00	635.00
Average Weight (kg)	Maximum	635.00	635.00	635.00	635.00
Average Weight (kg)	N	693.00	927.00	728.00	671.00
Average Weight (kg)	Q25	635.00	635.00	635.00	635.00
Average Weight (kg)	Q75	635.00	635.00	635.00	635.00
Average Weight (kg)	CV	0.00	0.00	0.00	0.00
Live animal weight (Mg)	Mean	0.00	0.00	0.00	0.00
Live animal weight (Mg)	StdDev	0.00	0.00	0.00	0.00
Live animal weight (Mg)	Median	0.00	0.00	0.00	0.00
Live animal weight (Mg)	Minimum	0.00	0.00	0.00	0.00
Live animal weight (Mg)	Maximum	0.00	0.00	0.00	0.00
Live animal weight (Mg)	N	693.00	927.00	728.00	671.00
Live animal weight (Mg)	Q25	0.00	0.00	0.00	0.00
Live animal weight (Mg)	Q75	0.00	0.00	0.00	0.00
Live animal weight (Mg)	CV	0.05	0.04	0.02	0.28
Exhaust Temperatures (C)	Mean	19.86	19.42	12.87	13.91
Exhaust Temperatures (C)	StdDev	6.81	6.56	8.23	7.18
Exhaust Temperatures (C)	Median	21.40	19.90	12.20	12.90
Exhaust Temperatures (C)	Minimum	5.20	5.00	-12.10	-4.40
Exhaust Temperatures (C)	Maximum	34.50	33.90	31.90	31.30
Exhaust Temperatures (C)	N	631.00	924.00	666.00	611.00
Exhaust Temperatures (C)	Q25	14.55	13.75	7.12	8.65
Exhaust Temperatures (C)	Q75	25.30	24.90	20.10	20.40
Exhaust Temperatures (C)	CV	0.34	0.34	0.64	0.52
Exhaust Relative Humidity (%)	Mean	56.38	54.70	44.65	42.62
Exhaust Relative Humidity (%)	StdDev	13.12	12.81	13.62	12.98
Exhaust Relative Humidity (%)	Median	55.10	52.60	41.50	39.50
Exhaust Relative Humidity (%)	Minimum	28.00	27.60	22.70	22.60
Exhaust Relative Humidity (%)	Maximum	88.40	83.80	80.20	78.60
Exhaust Relative Humidity (%)	N	599.00	924.00	728.00	671.00
Exhaust Relative Humidity (%)	Q25	45.60	44.90	34.27	33.10

1	2	CA5BB1	CA5BB2	WA5BB2	WA5BB4
Exhaust Relative Humidity (%)	Q75	66.80	63.82	51.62	48.70
Exhaust Relative Humidity (%)	CV	0.23	0.23	0.31	0.30
Airflow (dsm ³ s ⁻¹)	Mean	1331.90	1322.44	1047.93	1081.75
Airflow (dsm ³ s ⁻¹)	StdDev	687.33	628.03	527.79	584.63
Airflow (dsm ³ s ⁻¹)	Median	1240.00	1260.00	1030.00	1060.00
Airflow (dsm ³ s ⁻¹)	Minimum	225.00	225.00	159.00	89.40
Airflow (dsm ³ s ⁻¹)	Maximum	5040.00	4600.00	2790.00	3100.00
Airflow (dsm ³ s ⁻¹)	N	693.00	927.00	728.00	671.00
Airflow (dsm ³ s ⁻¹)	Q25	905.00	942.00	620.75	630.50
Airflow (dsm ³ s ⁻¹)	Q75	1580.00	1570.00	1332.50	1390.00
Airflow (dsm ³ s ⁻¹)	CV	0.52	0.47	0.50	0.54

3.3 Ambient

Table 3.12: Summary of ambient meteorological parameters for naturally ventilated barns.

1	2	CA5B	WA5B
Ambient Temperature (C)	Mean	16.47	10.65
Ambient Temperature (C)	StdDev	6.53	8.83
Ambient Temperature (C)	Median	16.00	9.90
Ambient Temperature (C)	Minimum	3.70	-11.00
Ambient Temperature (C)	Maximum	31.70	33.20
Ambient Temperature (C)	count	621.00	545.00
Ambient Temperature (C)	Q25	11.00	4.50
Ambient Temperature (C)	Q75	22.30	15.40
Ambient Temperature (C)	CV	0.40	0.83
Ambient Relative Humidity (%)	Mean	61.36	45.53
Ambient Relative Humidity (%)	StdDev	13.84	15.94
Ambient Relative Humidity (%)	Median	60.60	41.00
Ambient Relative Humidity (%)	Minimum	29.50	21.70
Ambient Relative Humidity (%)	Maximum	91.20	87.80
Ambient Relative Humidity (%)	count	621.00	545.00
Ambient Relative Humidity (%)	Q25	50.10	33.70
Ambient Relative Humidity (%)	Q75	72.40	52.60
Ambient Relative Humidity (%)	CV	0.23	0.35
Wind Speed (ms ⁻¹)	Mean	2.01	2.57
Wind Speed (ms ⁻¹)	StdDev	1.12	1.57
Wind Speed (ms ⁻¹)	Median	1.83	2.23
Wind Speed (ms ⁻¹)	Minimum	0.33	0.42
Wind Speed (ms ⁻¹)	Maximum	8.20	9.08
Wind Speed (ms ⁻¹)	count	631.00	545.00
Wind Speed (ms ⁻¹)	Q25	1.17	1.47
Wind Speed (ms ⁻¹)	Q75	2.54	3.21
Wind Speed (ms ⁻¹)	CV	0.56	0.61

4 Lagoons

4.1 Emissions

4.1.1 Ammonia (NH₃)

Table 4.1: NH₃ emission summary statistics for dairy lagoons (kg d⁻¹).

Statistic	IN5A	WA5A	WI5A
Mean	22.0	47.2	11.8
StdDev	19.9	8.9	12.6
Median	19.6	50.0	9.6
Minimum	-11.7	34.3	-3.6
Maximum	92.5	54.6	42.0
N	169.0	4.0	31.0
N<0	19.0	0.0	4.0
N>0	150.0	4.0	27.0
Q25	7.9	45.4	2.9
Q75	30.5	51.9	15.1
CV	90.4	18.9	107.5

Table 4.2: NH₃ emission summary statistics for dairy lagoons (kg d⁻¹ m⁻²).

Statistic	IN5A	WA5A	WI5A
Mean	0.0023	0.0036	0.0021
StdDev	0.0020	0.0007	0.0023
Median	0.0020	0.0038	0.0017
Minimum	-0.0012	0.0026	-0.0006
Maximum	0.0095	0.0041	0.0075
N	169.0000	4.0000	31.0000
N<0	19.0000	0.0000	4.0000
N>0	150.0000	4.0000	27.0000
Q25	0.0008	0.0034	0.0005
Q75	0.0031	0.0039	0.0027
CV	90.4164	18.9333	107.4633

4.1.2 Hydrogen Sulfide (H₂S)

Table 4.3: H₂S emission summary statistics for dairy lagoons (g d⁻¹).

Statistic	IN5A	WA5A	WI5A
Mean	8028	2300	925
StdDev	7535	NA	1821
Median	8011	2300	510
Minimum	-23	2300	-16
Maximum	33820	2300	7765
N	72	1	18
N<0	2	0	1
N>0	70	1	17
Q25	1453	2300	41
Q75	11367	2300	704
CV	94	NA	197

Table 4.4: H₂S emission summary statistics for dairy lagoons (g d⁻¹ m⁻²).

Statistic	IN5A	WA5A	WI5A
Mean	0.8631	0.16	0.1640
StdDev	0.8101	NA	0.3229
Median	0.8613	0.16	0.0905
Minimum	-0.0025	0.16	-0.0029
Maximum	3.6361	0.16	1.3768
N	72.0000	1.00	18.0000
N<0	2.0000	0.00	1.0000
N>0	70.0000	1.00	17.0000
Q25	0.1563	0.16	0.0073
Q75	1.2221	0.16	0.1248
CV	93.8579	NA	196.9149

4.2 Environmental

Table 4.5: Environmental parameter summary statistics for dairy lagoons.

Parameter	Stat	IN5A	WI5A
Lagoon Temperature (C)	Mean	21.684	5.216
Lagoon Temperature (C)	StdDev	4.518	1.269
Lagoon Temperature (C)	Median	22.179	4.749
Lagoon Temperature (C)	Minimum	11.269	4.575
Lagoon Temperature (C)	Maximum	27.627	7.796
Lagoon Temperature (C)	N	33.000	6.000
Lagoon Temperature (C)	Q25	19.954	4.605
Lagoon Temperature (C)	Q75	25.113	4.837
Lagoon Temperature (C)	CV	0.208	0.243
Oxidation reduction potential (mV)	Mean	-480.694	-500.993
Oxidation reduction potential (mV)	StdDev	27.586	11.291
Oxidation reduction potential (mV)	Median	-481.203	-505.614
Oxidation reduction potential (mV)	Minimum	-529.350	-506.063
Oxidation reduction potential (mV)	Maximum	-417.255	-477.968
Oxidation reduction potential (mV)	N	34.000	6.000
Oxidation reduction potential (mV)	Q25	-500.035	-505.947
Oxidation reduction potential (mV)	Q75	-465.025	-504.885
Oxidation reduction potential (mV)	CV	-0.057	-0.023
pH	Mean	7.420	7.024
pH	StdDev	0.513	0.039
pH	Median	7.167	7.014
pH	Minimum	7.024	6.982
pH	Maximum	8.367	7.087
pH	N	34.000	6.000
pH	Q25	7.070	6.999
pH	Q75	7.952	7.044
pH	CV	0.069	0.006

4.3 Ambient

Table 4.6: Summary of ambient meteorological parameters for dairy lagoons.

Parameter	Stat	IN5A	WA5A	W15A
Ambient Temperature (C)	Mean	7.098	24.3	-2.232
Ambient Temperature (C)	StdDev	10.431	NA	9.424
Ambient Temperature (C)	Median	7.102	24.3	-1.087
Ambient Temperature (C)	Minimum	-19.735	24.3	-21.503
Ambient Temperature (C)	Maximum	27.108	24.3	19.372
Ambient Temperature (C)	count	141.000	1.0	32.000
Ambient Temperature (C)	Q25	-0.316	24.3	-6.785
Ambient Temperature (C)	Q75	15.287	24.3	1.891
Ambient Temperature (C)	CV	1.469	NA	-4.222
Relative humidity (%)	Mean	72.332	27.3	70.942
Relative humidity (%)	StdDev	12.323	NA	9.809
Relative humidity (%)	Median	74.300	27.3	71.332
Relative humidity (%)	Minimum	38.049	27.3	46.354
Relative humidity (%)	Maximum	94.347	27.3	94.177
Relative humidity (%)	count	147.000	1.0	32.000
Relative humidity (%)	Q25	64.283	27.3	65.487
Relative humidity (%)	Q75	82.247	27.3	76.582
Relative humidity (%)	CV	0.170	NA	0.138
Barometric Pressure (kPa)	Mean	98.711	98.2	97.409
Barometric Pressure (kPa)	StdDev	0.749	NA	0.909
Barometric Pressure (kPa)	Median	98.634	98.2	97.284
Barometric Pressure (kPa)	Minimum	96.657	98.2	96.033
Barometric Pressure (kPa)	Maximum	100.653	98.2	99.732
Barometric Pressure (kPa)	count	147.000	1.0	32.000
Barometric Pressure (kPa)	Q25	98.259	98.2	96.518
Barometric Pressure (kPa)	Q75	99.204	98.2	97.975
Barometric Pressure (kPa)	CV	0.008	NA	0.009
Wins speed (ms-1)	Mean	3.240	4.3	3.460
Wins speed (ms-1)	StdDev	1.213	NA	1.254
Wins speed (ms-1)	Median	3.061	4.3	3.369
Wins speed (ms-1)	Minimum	1.121	4.3	1.468
Wins speed (ms-1)	Maximum	7.746	4.3	6.280
Wins speed (ms-1)	count	147.000	1.0	32.000
Wins speed (ms-1)	Q25	2.312	4.3	2.558
Wins speed (ms-1)	Q75	3.927	4.3	4.059
Wins speed (ms-1)	CV	0.374	NA	0.362

5 Corral

5.1 Emissions

5.1.1 Ammonia (NH₃)

Table 5.1: NH₃ emission summary statistics for dairy corral (kg d⁻¹).

Statistic	TX5A
Mean	755
StdDev	317
Median	698
Minimum	241
Maximum	1719
N	73
N>0	73
Q25	582
Q75	875
CV	42

Table 5.2: NH₃ emission summary statistics for dairy corral (kg d⁻¹ m⁻²).

Statistic	TX5A
Mean	3.12
StdDev	1.31
Median	2.89
Minimum	0.99
Maximum	7.10
N	73.00
N>0	73.00
	139.00
Q25	2.41
Q75	3.61
CV	42.05

5.1.2 Hydrogen Sulfide (H₂S)

Table 5.3: H₂S emission summary statistics for dairy corral (g d⁻¹).

Statistic	TX5A
Mean	10.7
StdDev	4.3
Median	9.9
Minimum	4.8
Maximum	29.5
N	49.0
N>0	49.0
	163.0
Q25	8.1
Q75	11.8
CV	40.4

Table 5.4: H₂S emission summary statistics for dairy corral (g d⁻¹ m⁻²).

Statistic	TX5A
Mean	0.044
StdDev	0.018
Median	0.041
Minimum	0.020
Maximum	0.122
N	49.000
N>0	49.000
	163.000
Q25	0.034
Q75	0.049
CV	40.391

5.2 Ambient

Table 5.5: Summary of ambient meteorological parameters for dairy corral.

Parameter	Stat	TX5A
Ambient Temperature (C)	Mean	14.137
Ambient Temperature (C)	StdDev	8.164
Ambient Temperature (C)	Median	13.419
Ambient Temperature (C)	Minimum	-5.644
Ambient Temperature (C)	Maximum	27.496
Ambient Temperature (C)	count	71.000
Ambient Temperature (C)	Q25	9.544
Ambient Temperature (C)	Q75	21.873
Ambient Temperature (C)	CV	0.578
Relative humidity (%)	Mean	47.113
Relative humidity (%)	StdDev	13.468
Relative humidity (%)	Median	48.054
Relative humidity (%)	Minimum	21.881
Relative humidity (%)	Maximum	78.542
Relative humidity (%)	count	71.000
Relative humidity (%)	Q25	37.527
Relative humidity (%)	Q75	57.266
Relative humidity (%)	CV	0.286
Barometric Pressure (kPa)	Mean	88.129
Barometric Pressure (kPa)	StdDev	0.493
Barometric Pressure (kPa)	Median	88.104
Barometric Pressure (kPa)	Minimum	87.013
Barometric Pressure (kPa)	Maximum	89.298
Barometric Pressure (kPa)	count	71.000
Barometric Pressure (kPa)	Q25	87.810
Barometric Pressure (kPa)	Q75	88.472
Barometric Pressure (kPa)	CV	0.006
Wins speed (ms-1)	Mean	4.435
Wins speed (ms-1)	StdDev	1.083
Wins speed (ms-1)	Median	4.416
Wins speed (ms-1)	Minimum	2.351
Wins speed (ms-1)	Maximum	6.791
Wins speed (ms-1)	count	82.000
Wins speed (ms-1)	Q25	3.652
Wins speed (ms-1)	Q75	5.108
Wins speed (ms-1)	CV	0.244

Appendix E: Time Series Plots

2024-10-06

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1 Mechanically Ventilated
1.1 Emissions
1.1.1 Ammonia (NH₃)

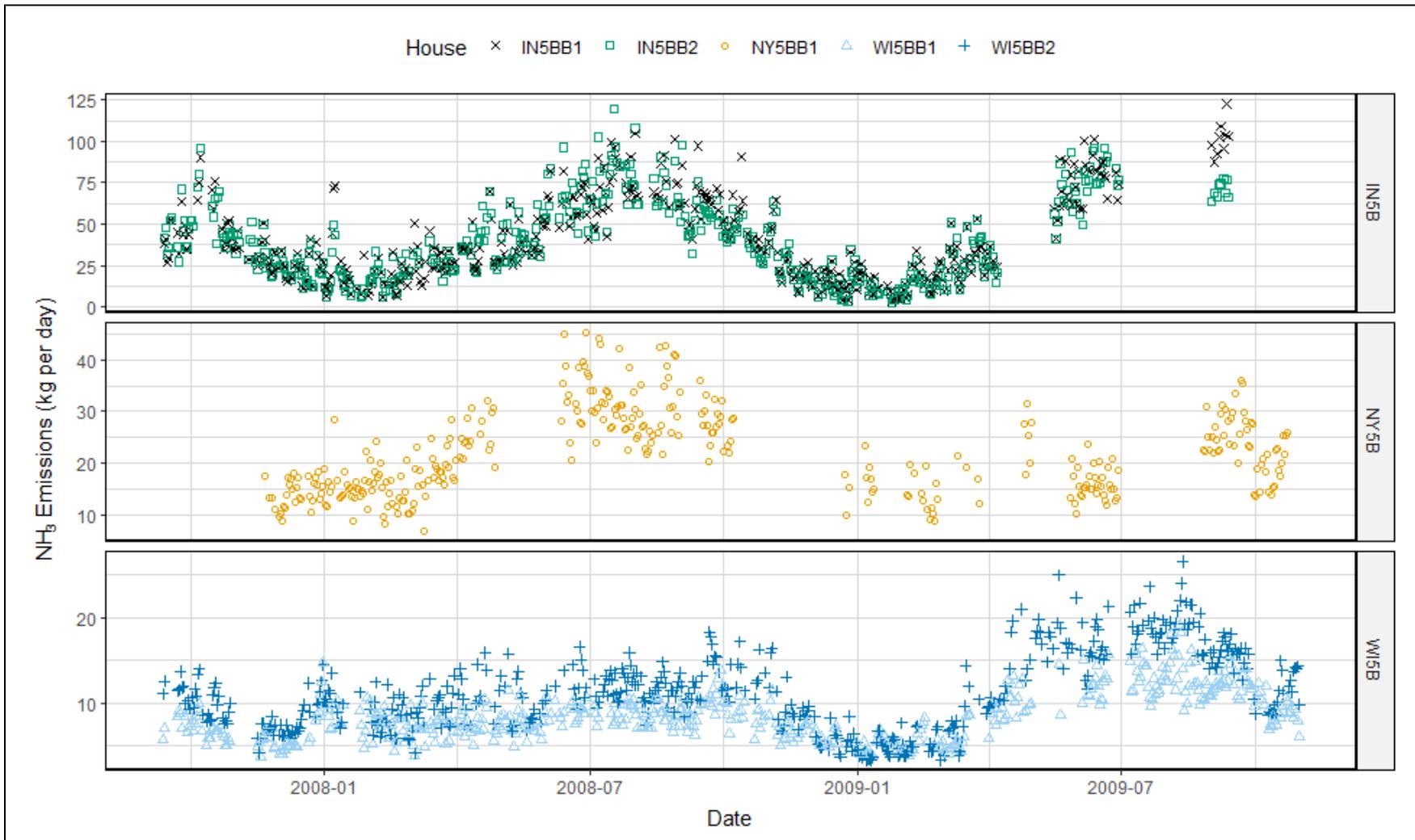


Figure 1.1: NH₃ emission time series for dairy mechanically ventilated barns (kg d⁻¹).

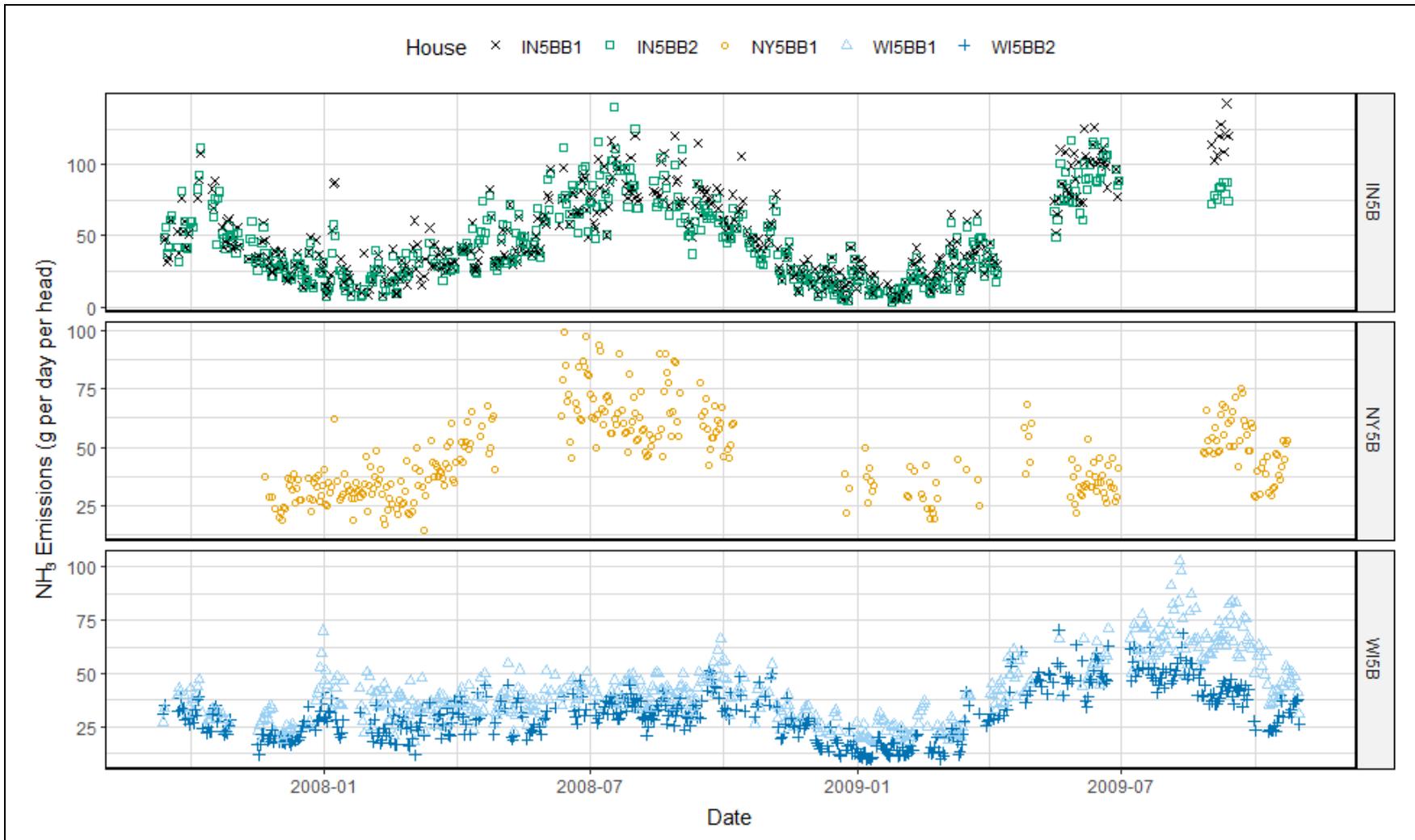


Figure 1.2: NH₃ emission time series for dairy mechanically ventilated barns (g d⁻¹hd⁻¹).

1.1.2 Hydrogen Sulfide (H₂S)



Figure 1.3: H₂S emission time series for dairy mechanically ventilated barns (g d⁻¹).



Figure 1.4: H₂S emission time series for dairy mechanically ventilated barns (mg d⁻¹hd⁻¹).

1.1.3 Particulate Matter (PM₁₀)

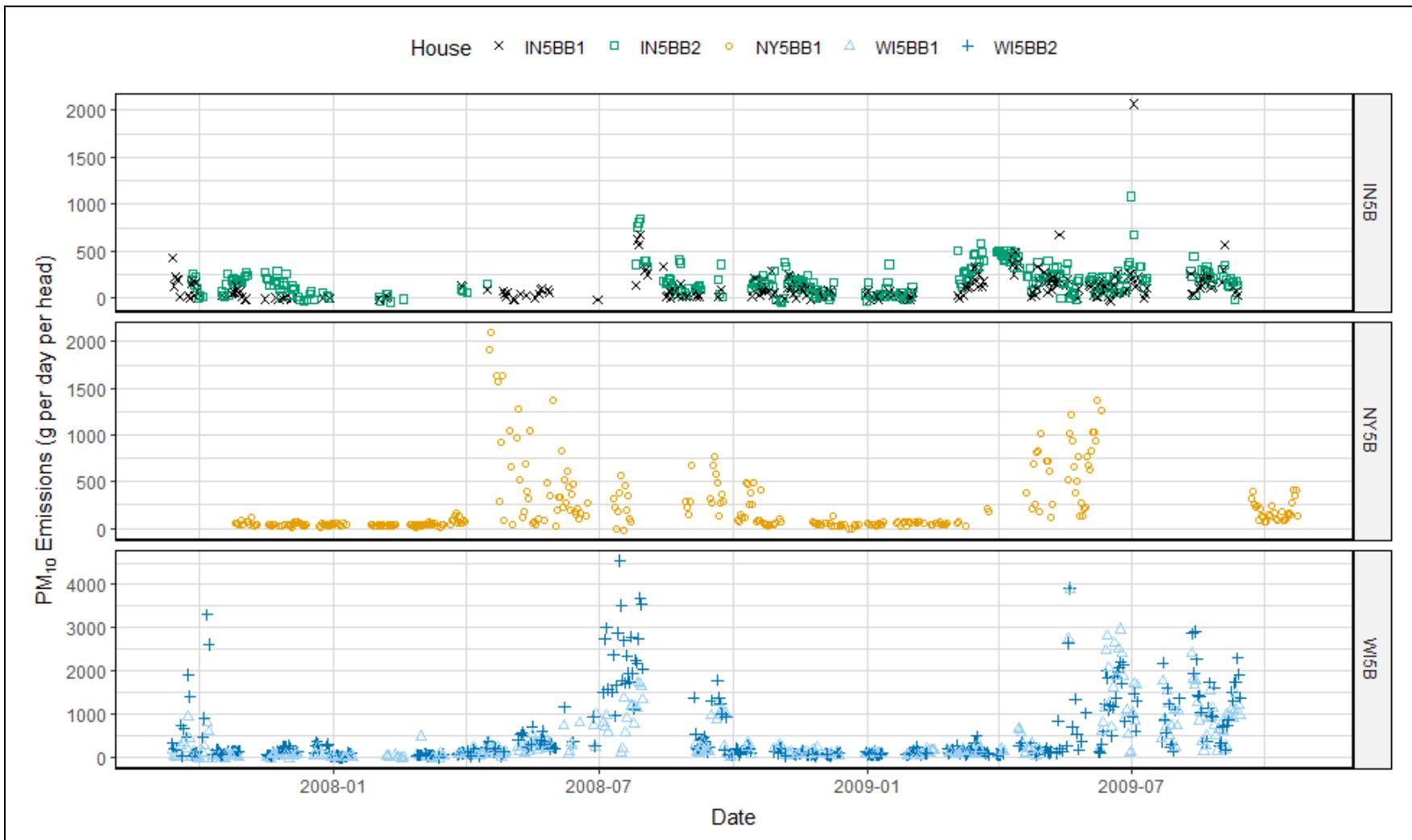


Figure 1.5: PM₁₀ emission time series for dairy mechanically ventilated barns (g d⁻¹).

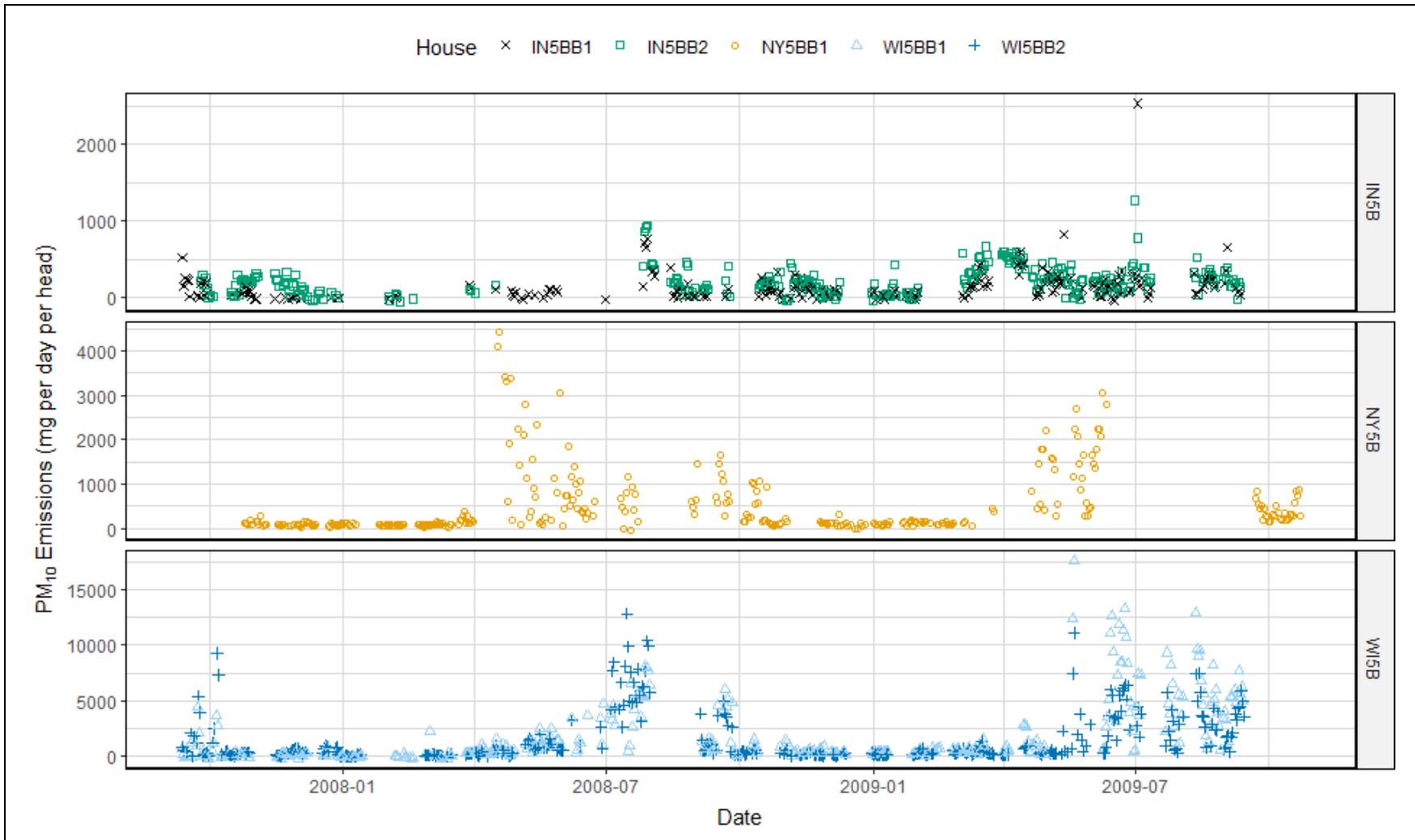


Figure 1.6: PM₁₀ emission time series for dairy mechanically ventilated barns (mg d⁻¹hd⁻¹).

1.1.4 Particulate Matter (PM_{2.5})

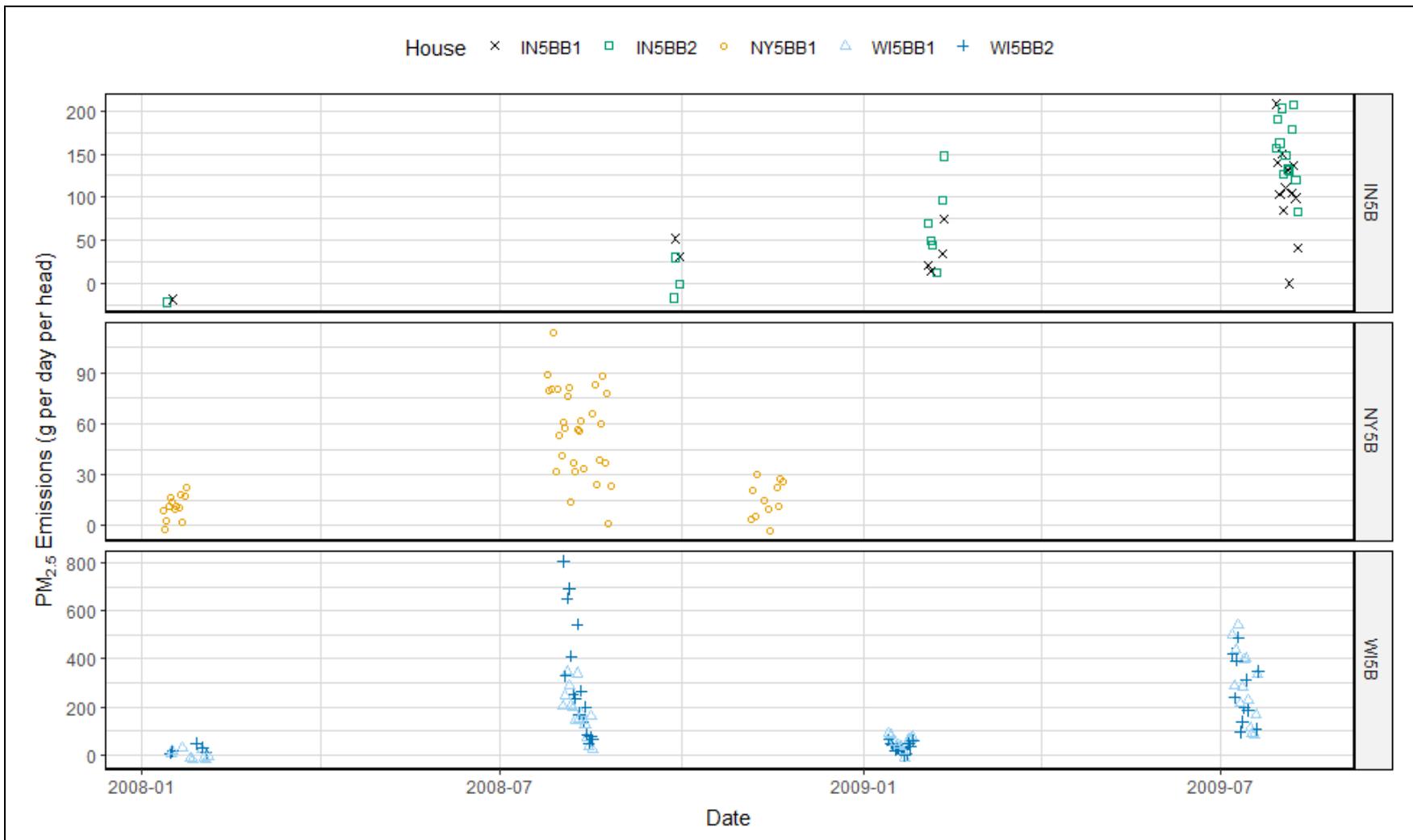


Figure 1.7: PM_{2.5} emission time series for dairy mechanically ventilated barns (g d⁻¹).

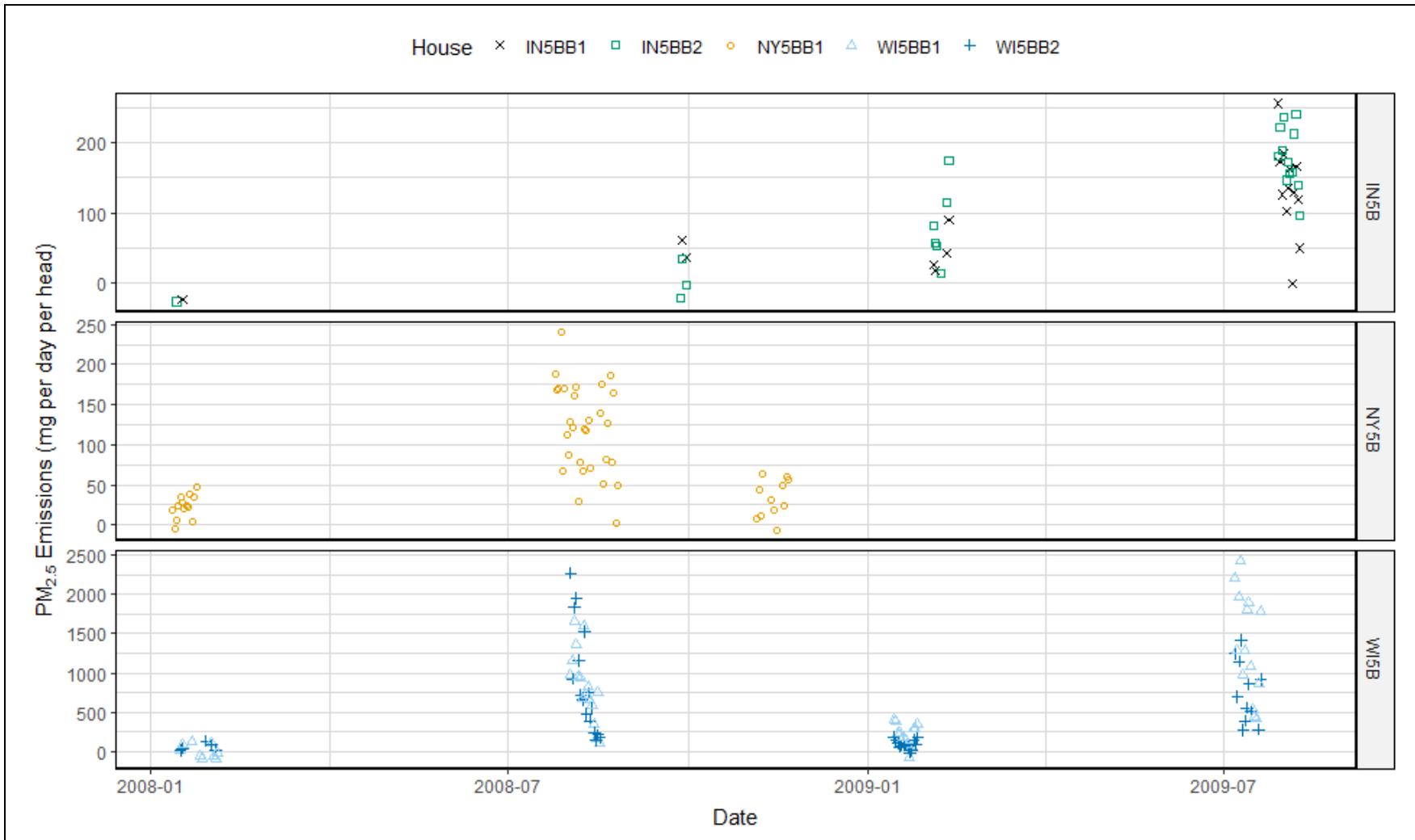


Figure 1.8: PM_{2.5} emission time series for dairy mechanically ventilated barns (mg d⁻¹hd⁻¹).

1.1.5 Total Suspended Particulates (TSP)

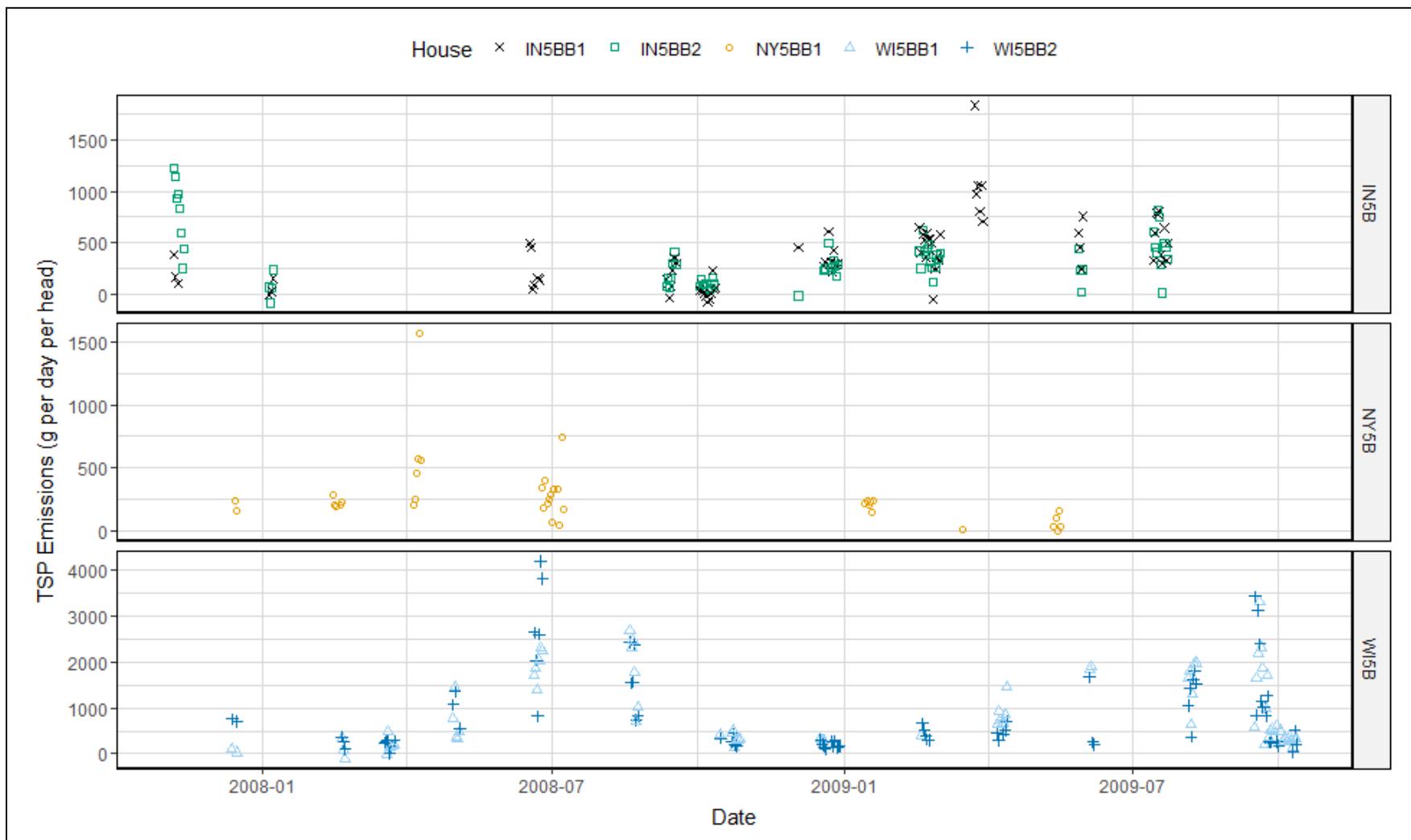


Figure 1.9: TSP emission time series for dairy mechanically ventilated barns (g d^{-1}).

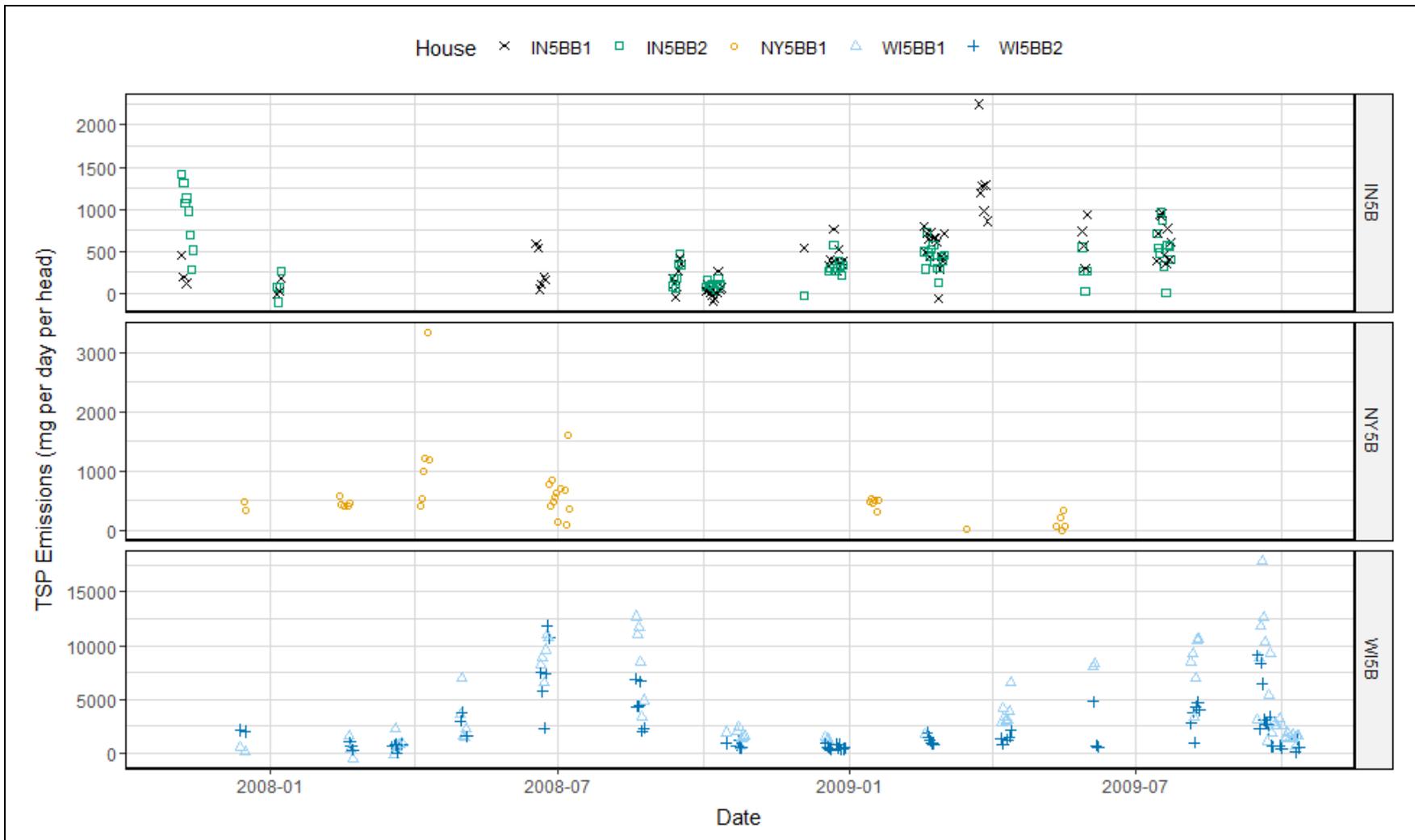


Figure 1.10: TSP emission time series for dairy mechanically ventilated barns ($\text{mg d}^{-1}\text{hd}^{-1}$).

1.2 Environmental

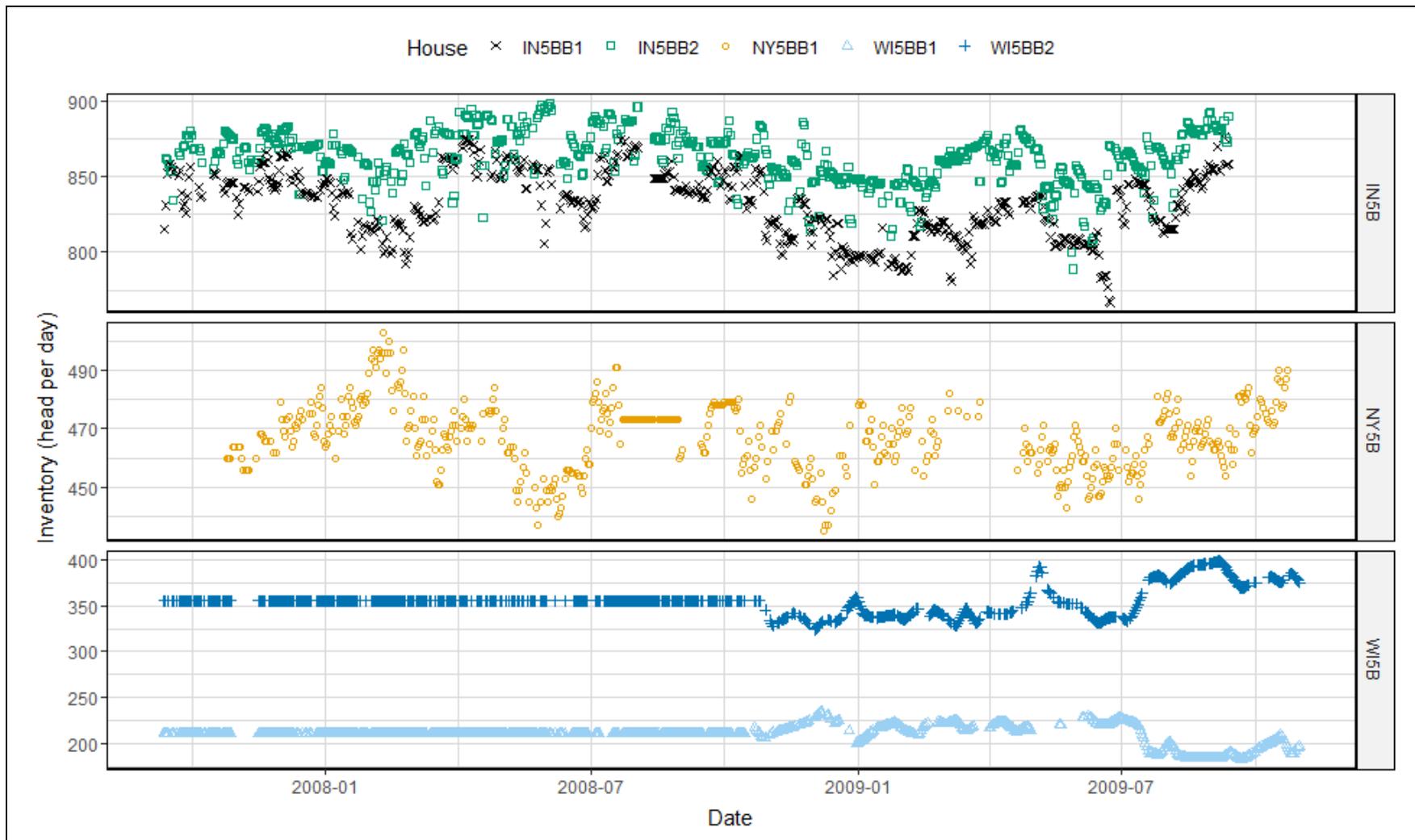


Figure 1.11: Inventory time series for dairy mechanically ventilated barns (hd).

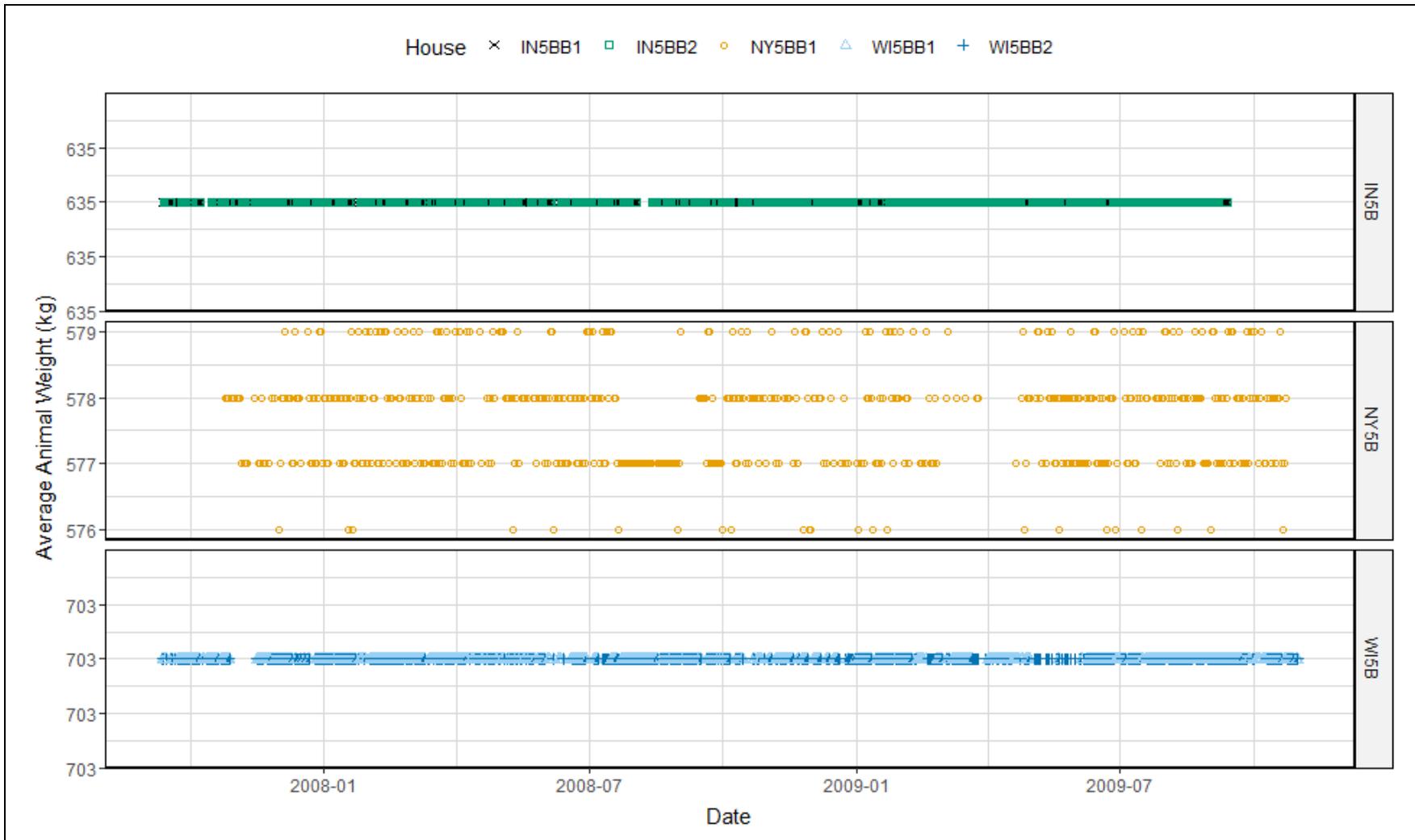


Figure 1.12: Average animal weight emission time series for dairy mechanically ventilated barns (kg).

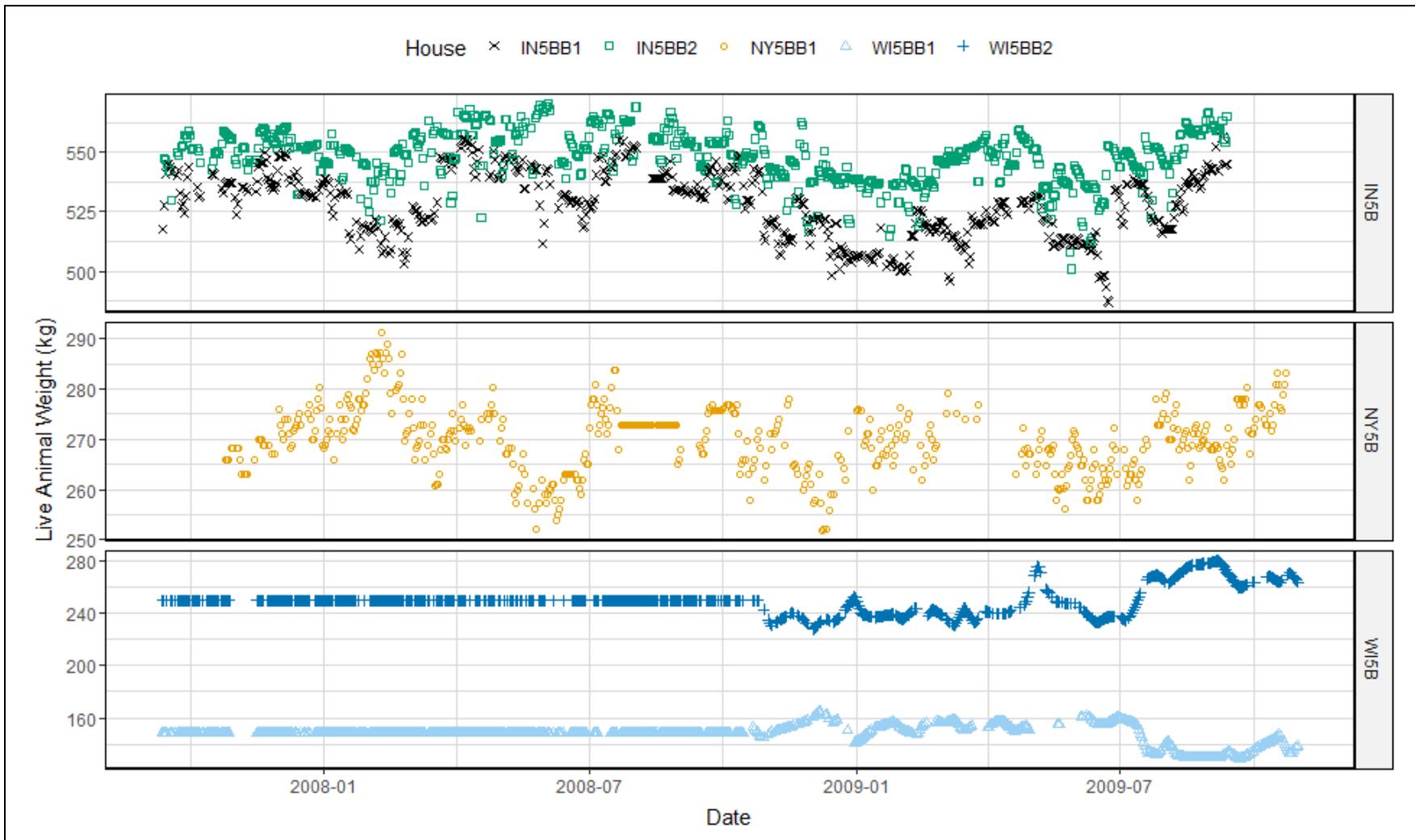


Figure 1.13: Live animal weight time series for dairy mechanically ventilated barns (kg).

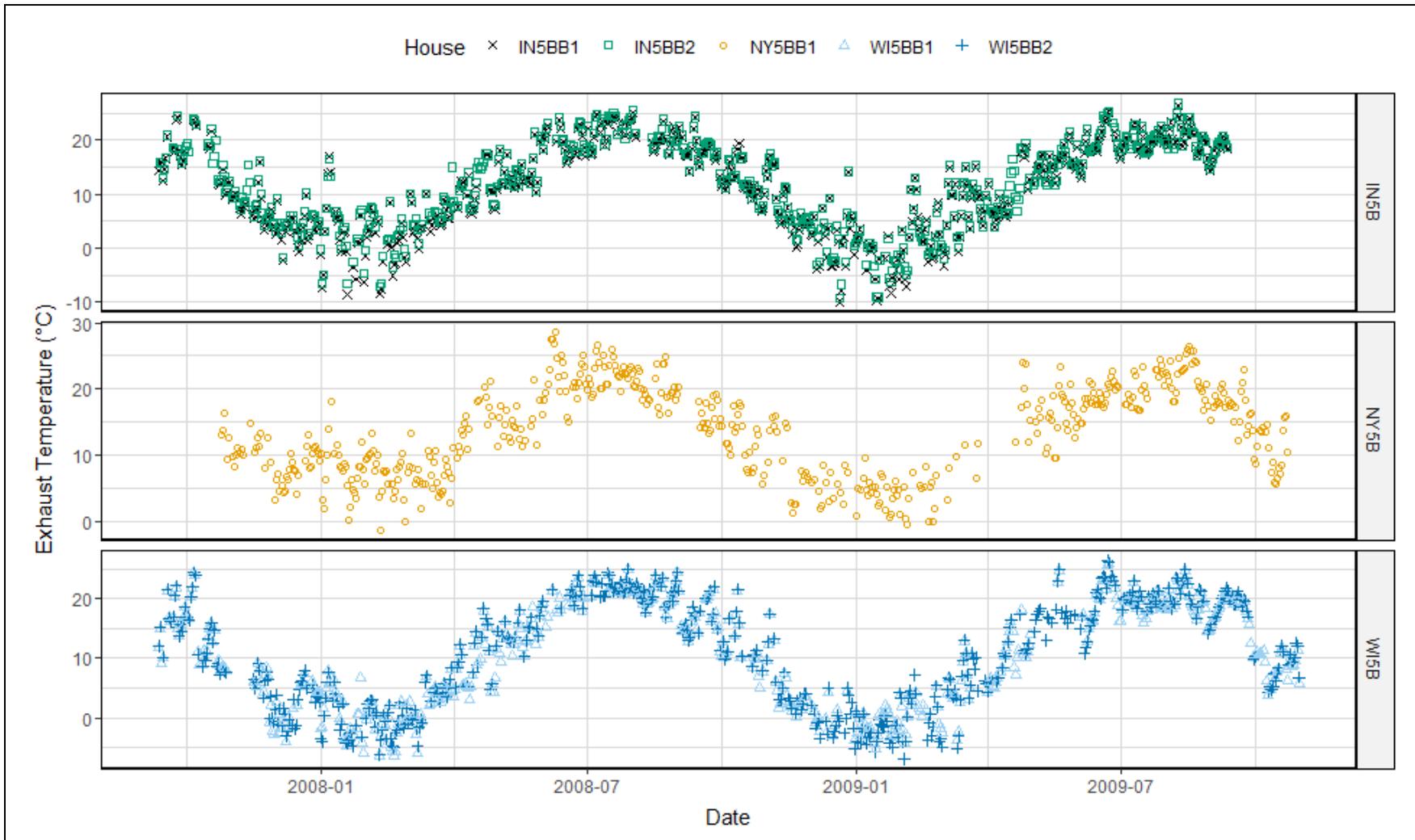


Figure 1.14: Exhaust temperature time series for dairy mechanically ventilated barns (°C).

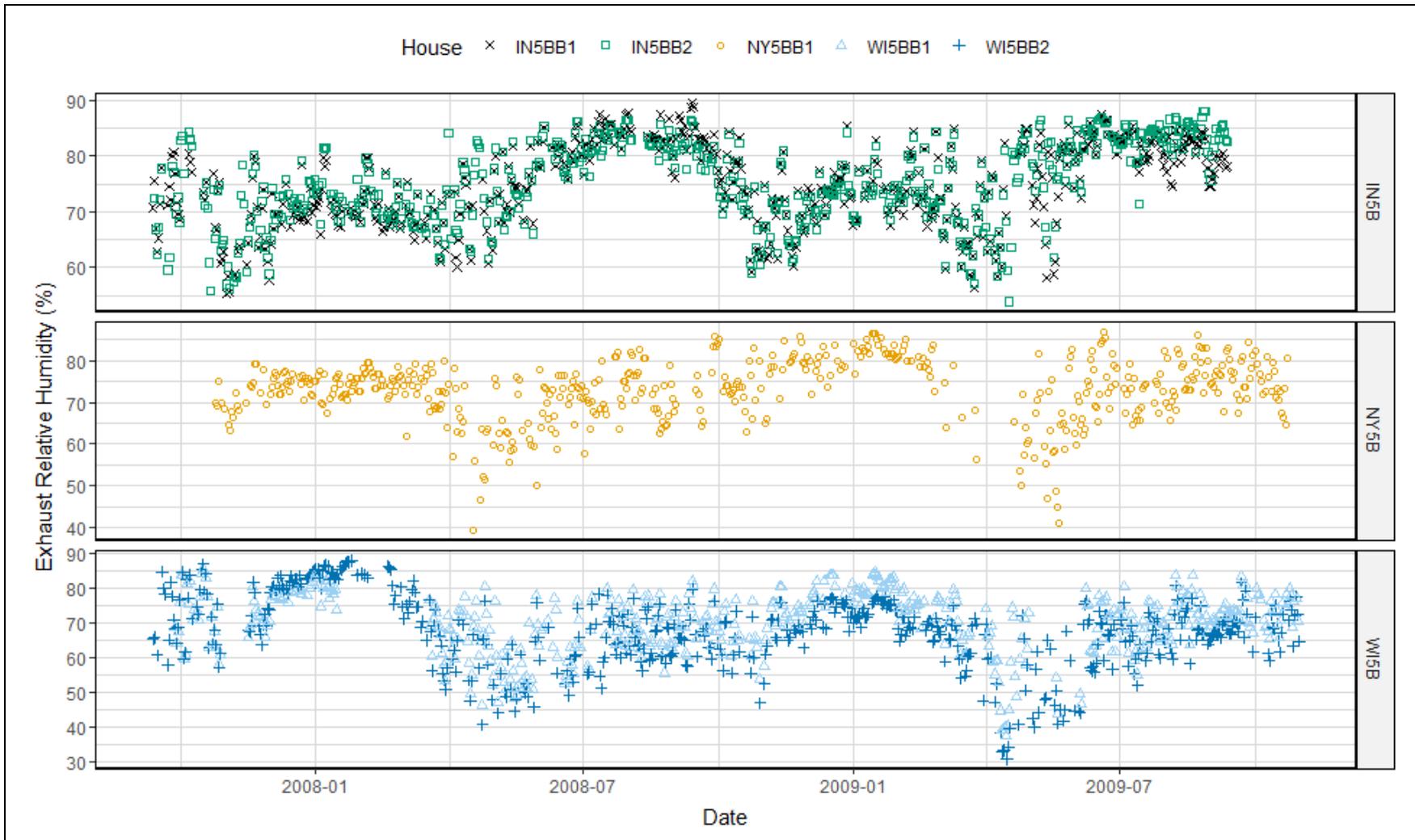


Figure 1.15: Exhaust relative humidity time series for dairy mechanically ventilated barns (%).

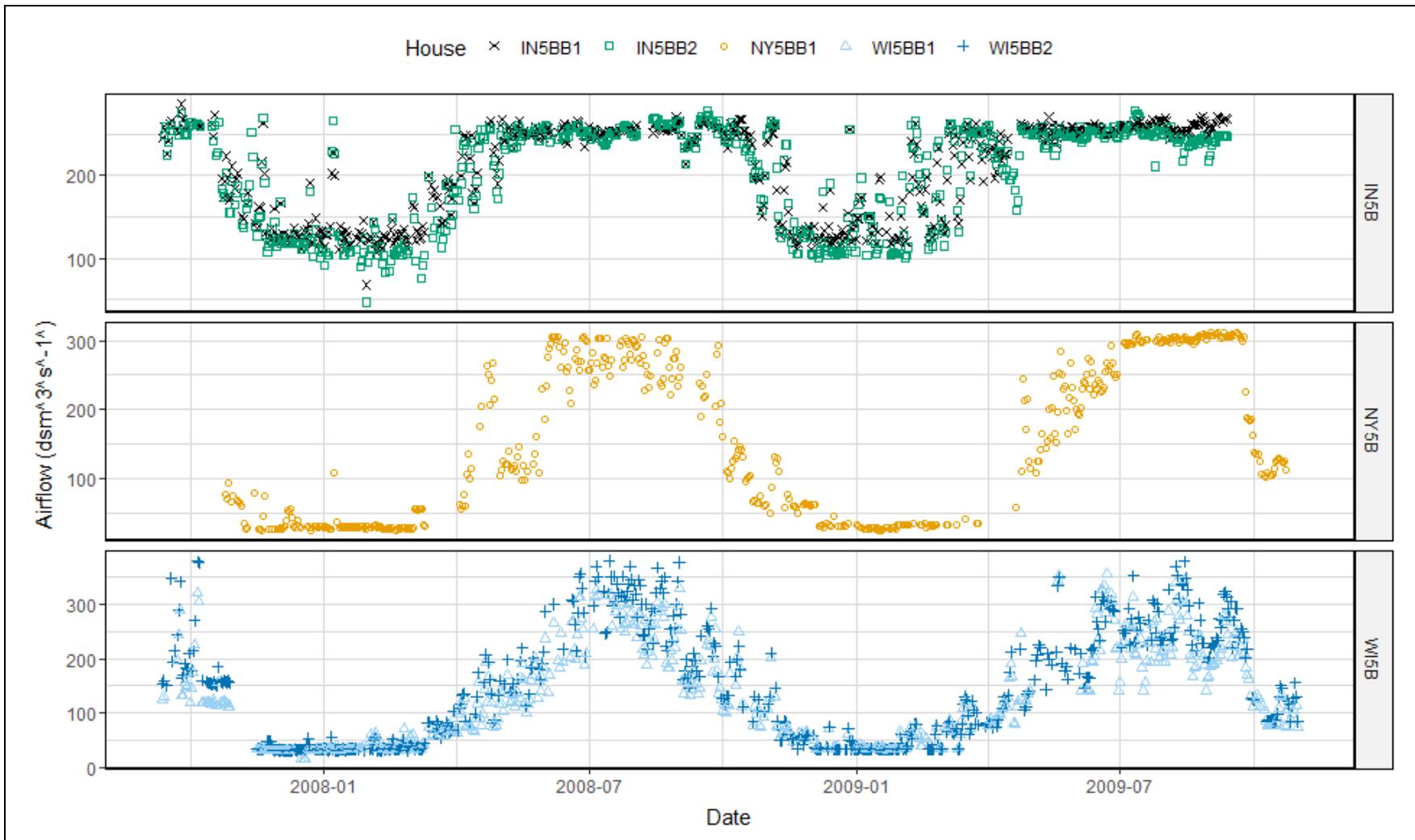


Figure 1.16: Airflow time series for dairy mechanically ventilated barns (dscm³s⁻¹).

1.3 Ambient

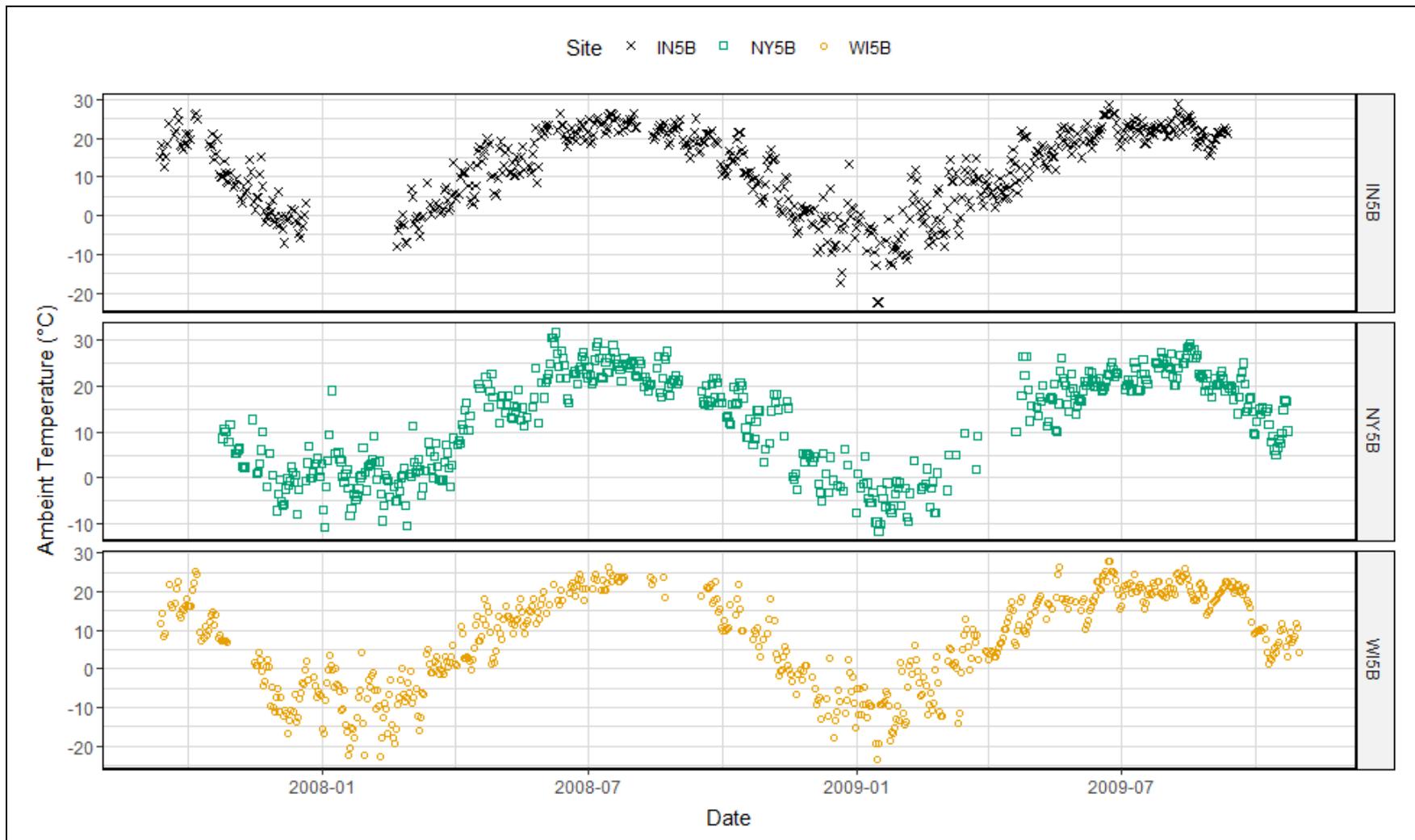


Figure 1.17: Ambient temperature time series for dairy mechanically ventilated barns (°C).

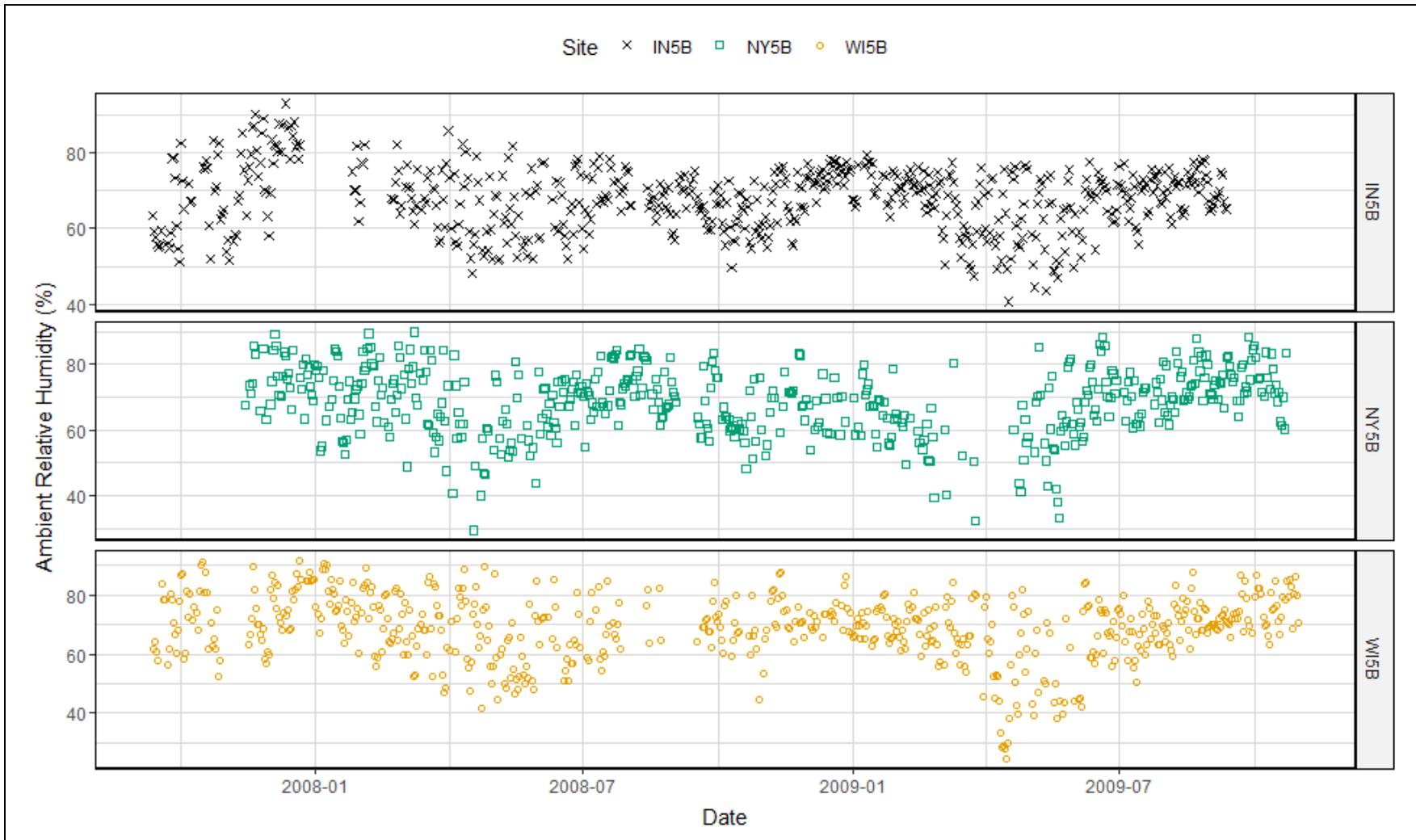


Figure 1.18: Ambient relative humidity time series for dairy mechanically ventilated barns (%).

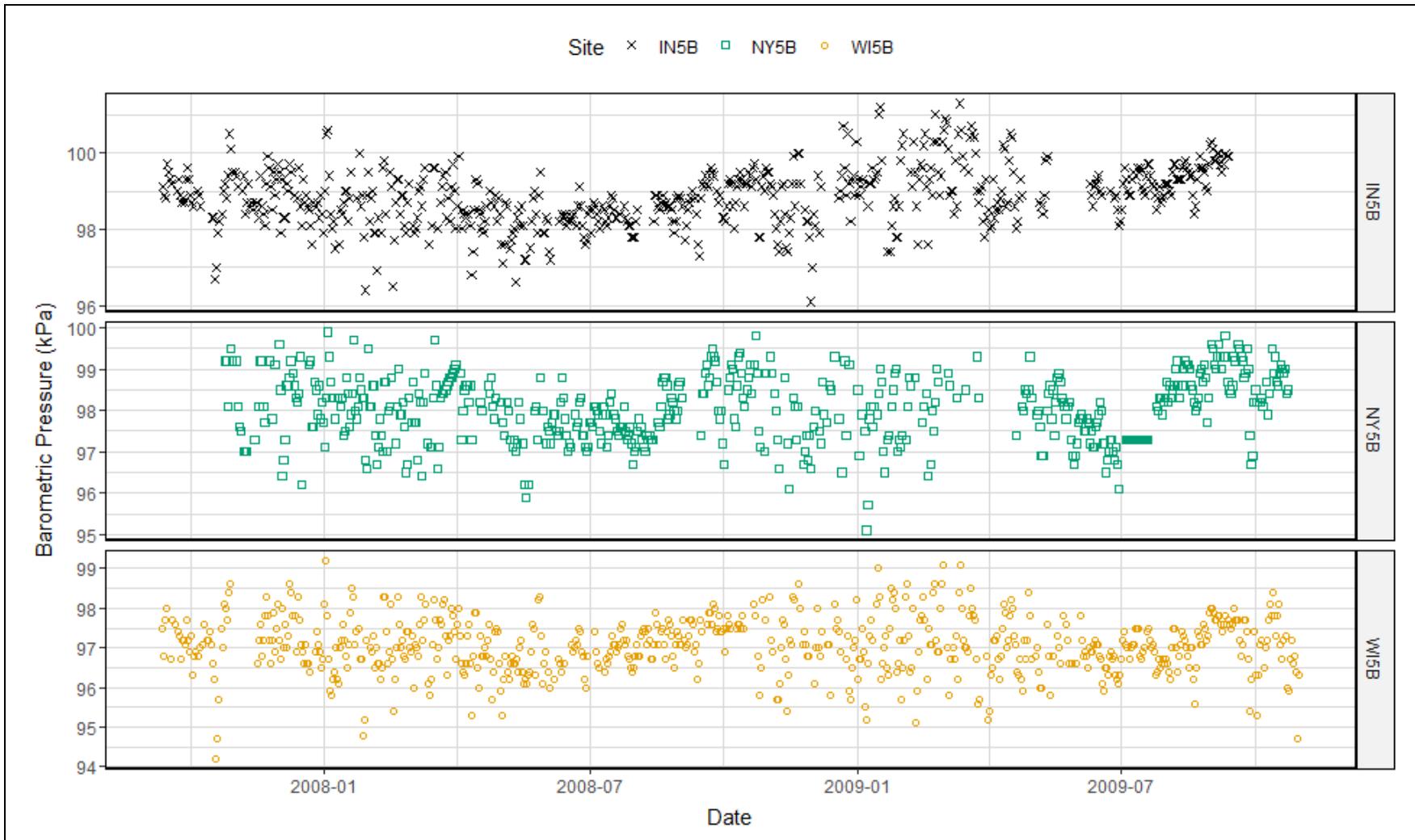


Figure 1.19: Barometric pressure time series for dairy mechanically ventilated barns (kPa).

2 Milking Centers
2.1 Emissions
2.1.1 Ammonia (NH₃)

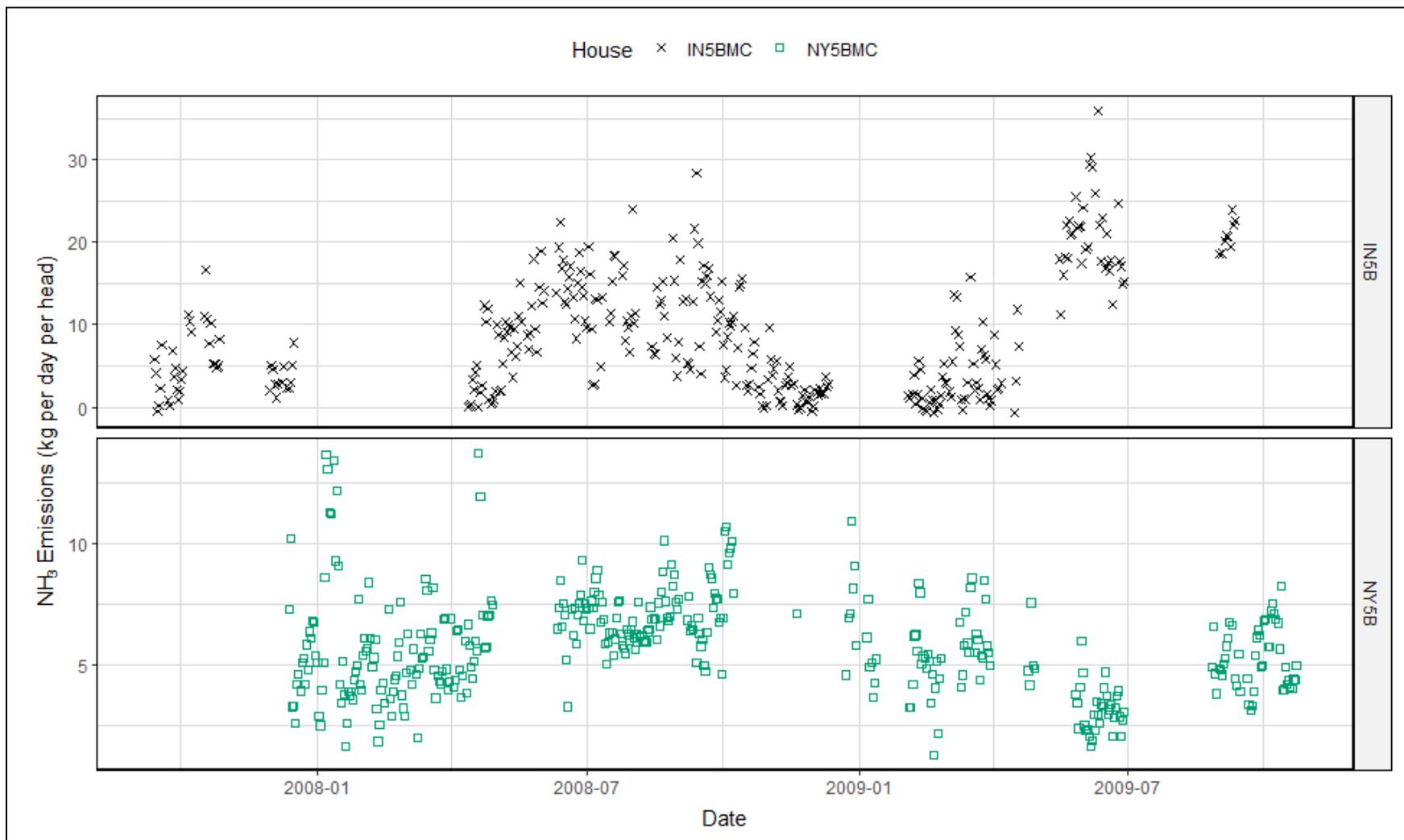


Figure 2.1: NH₃ emission time series for milking centers (kg d⁻¹).



Figure 2.2: NH₃ emission time series for milking centers (g d⁻¹hd⁻¹).

2.1.2 Hydrogen Sulfide (H₂S)

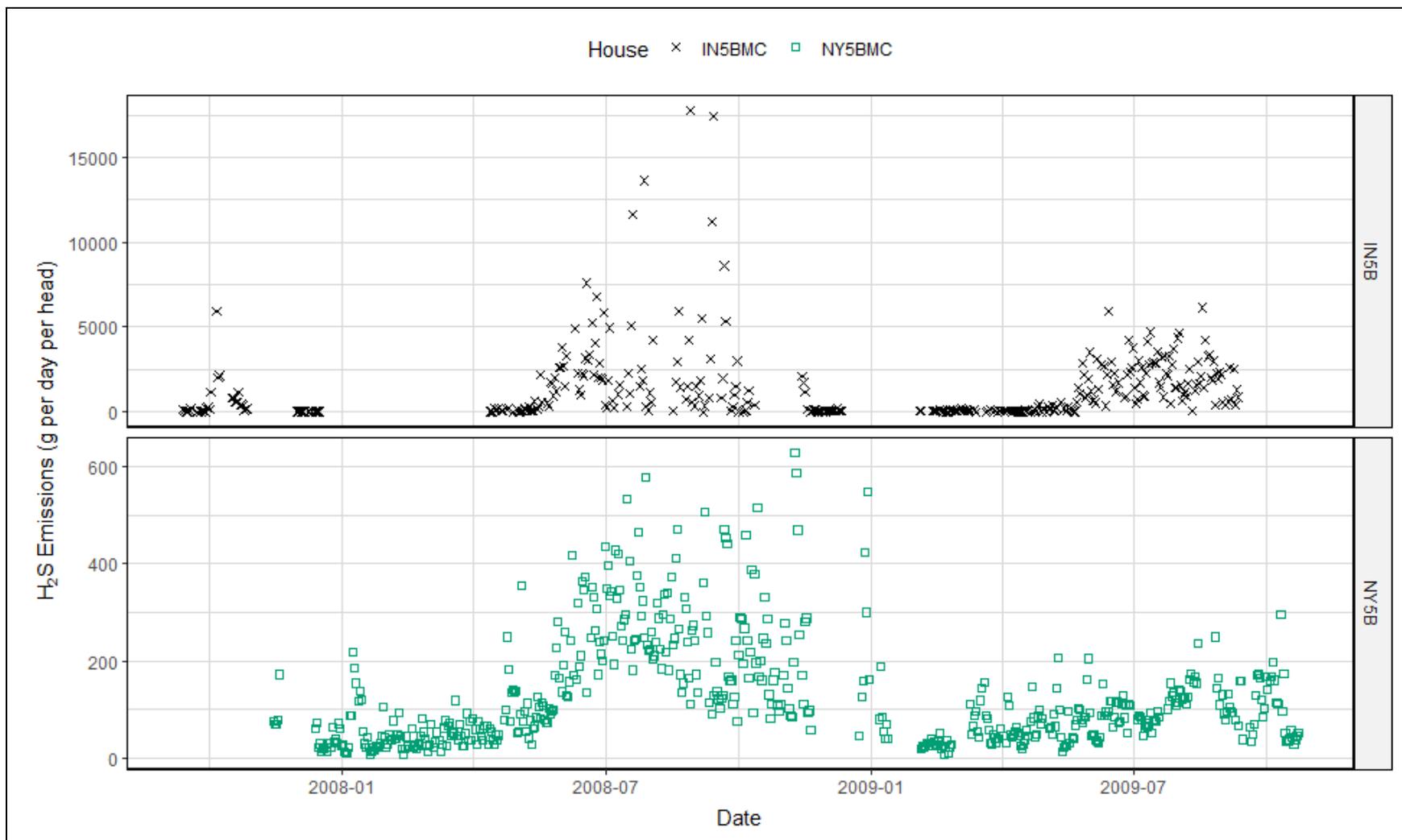


Figure 2.3: H₂S emission time series for milking centers (g d⁻¹).

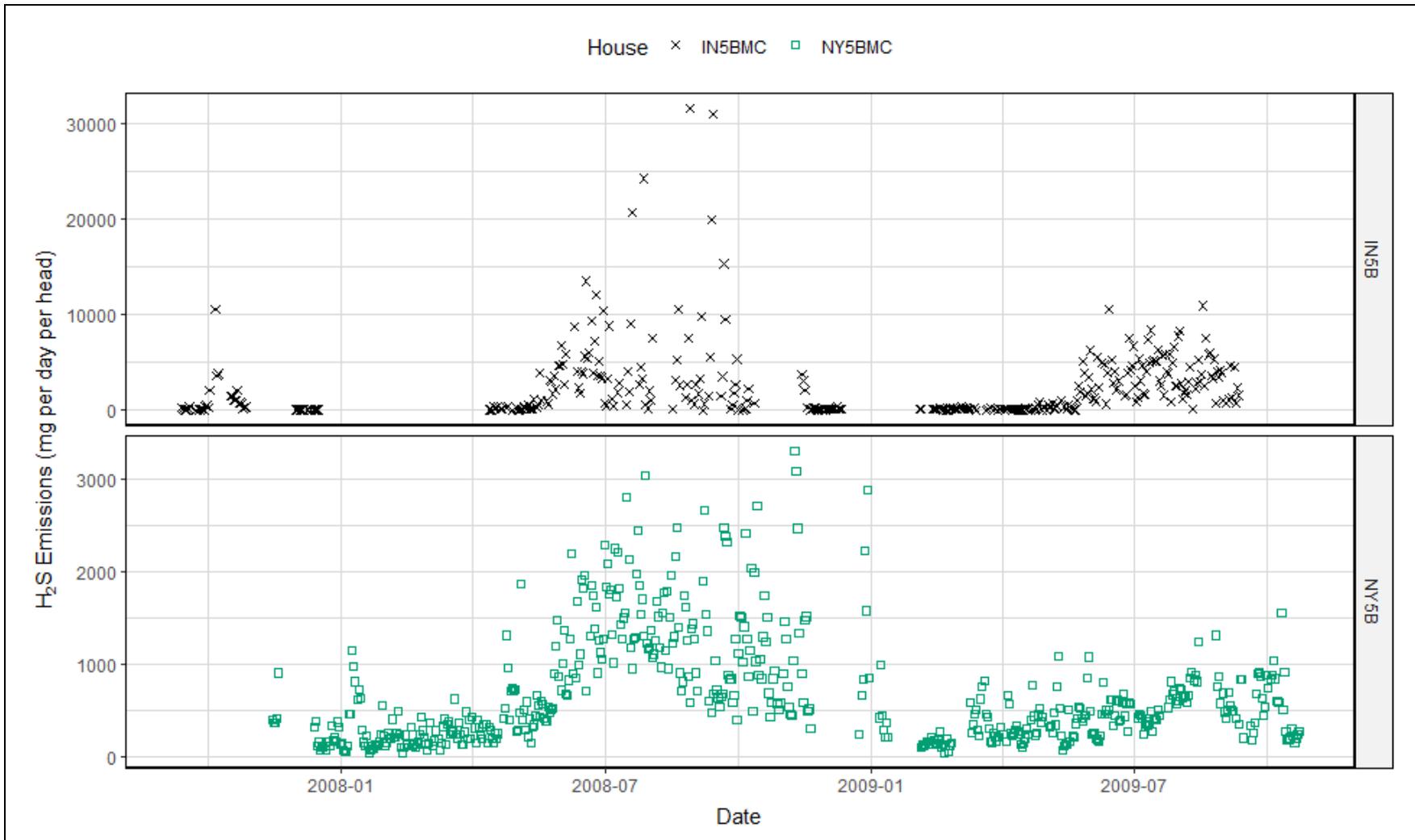


Figure 2.4: H₂S emission time series for milking centers (mg d⁻¹hd⁻¹).

2.1.3 Particulate Matter (PM₁₀)

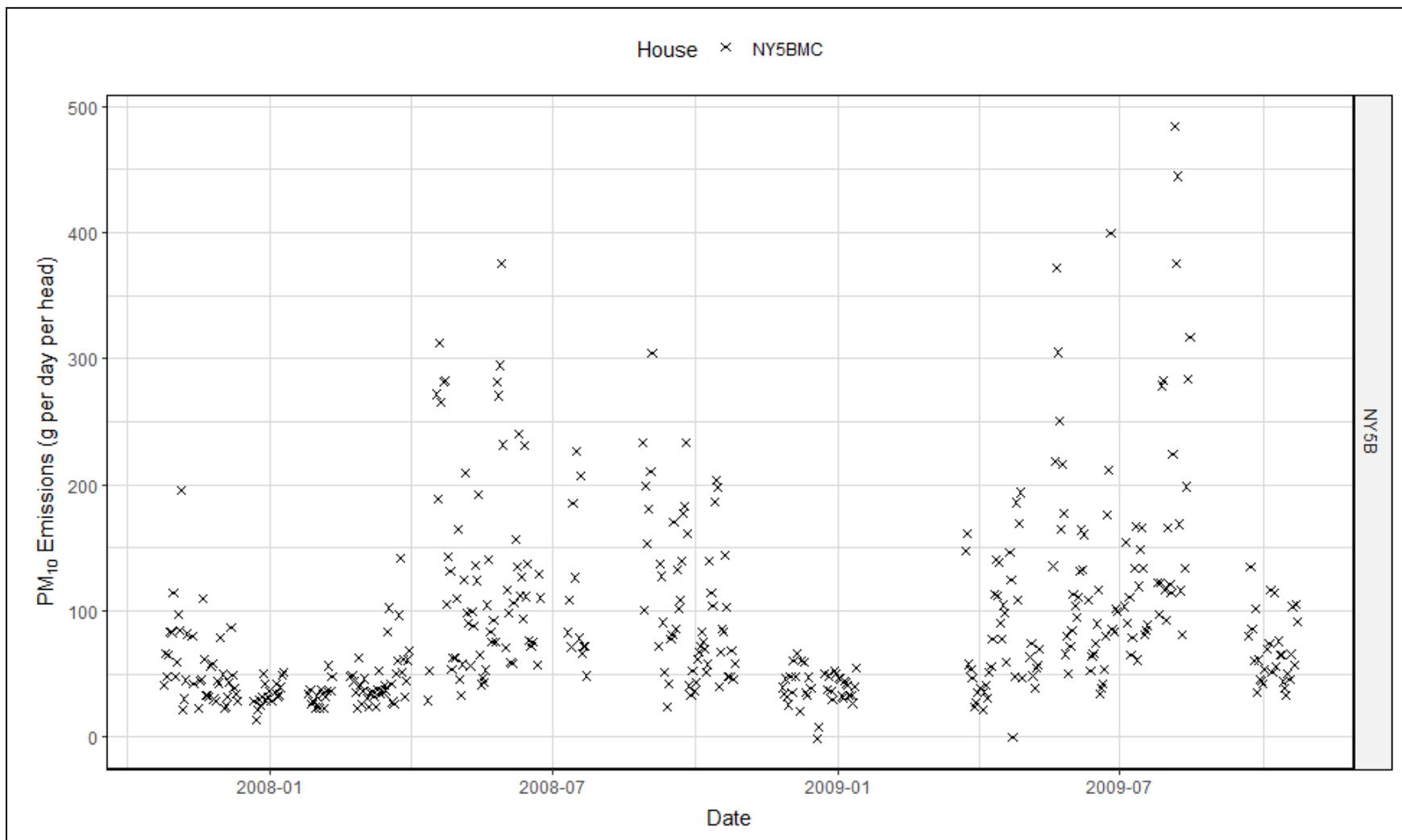


Figure 2.5: PM₁₀ emission time series for milking centers (g d⁻¹).

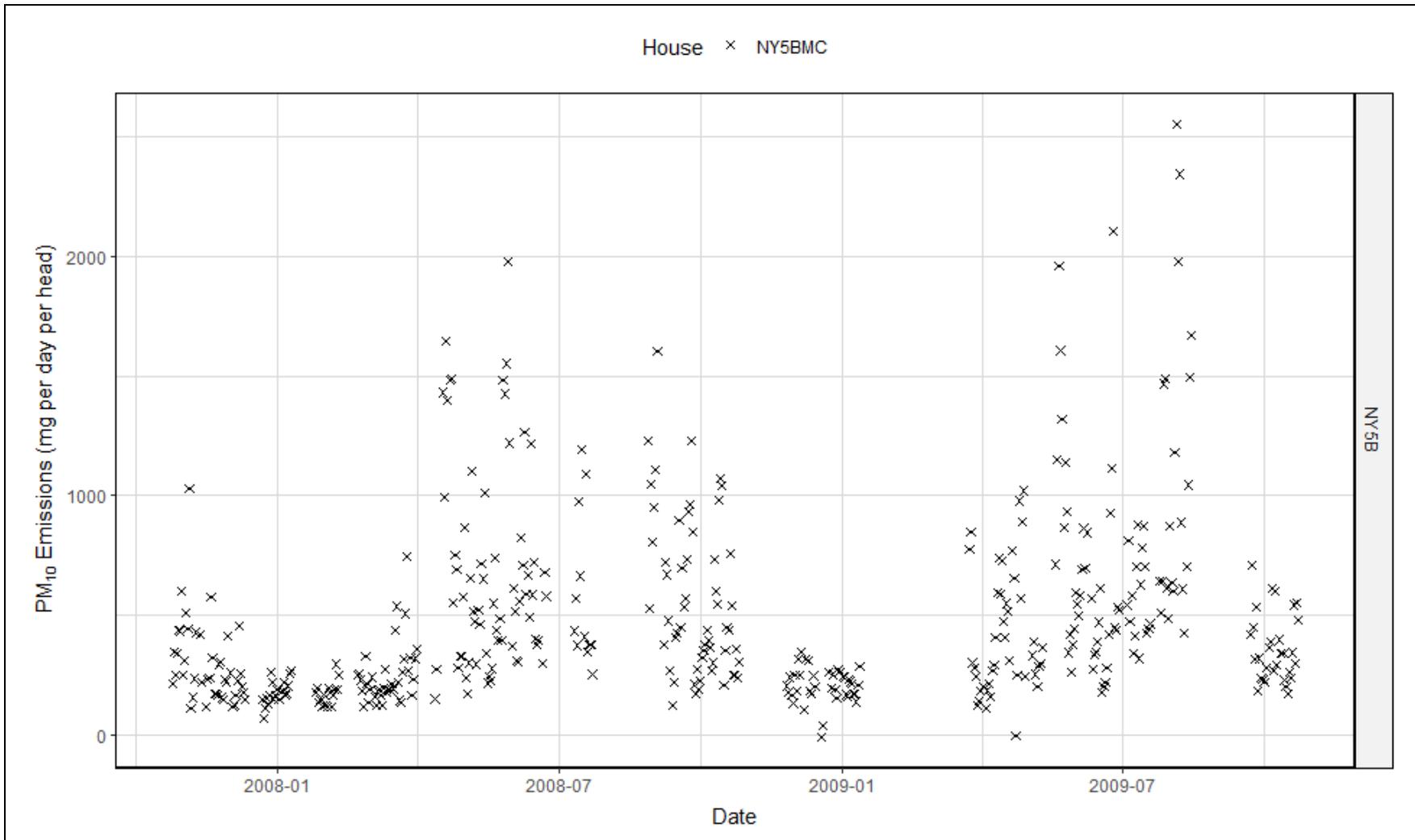
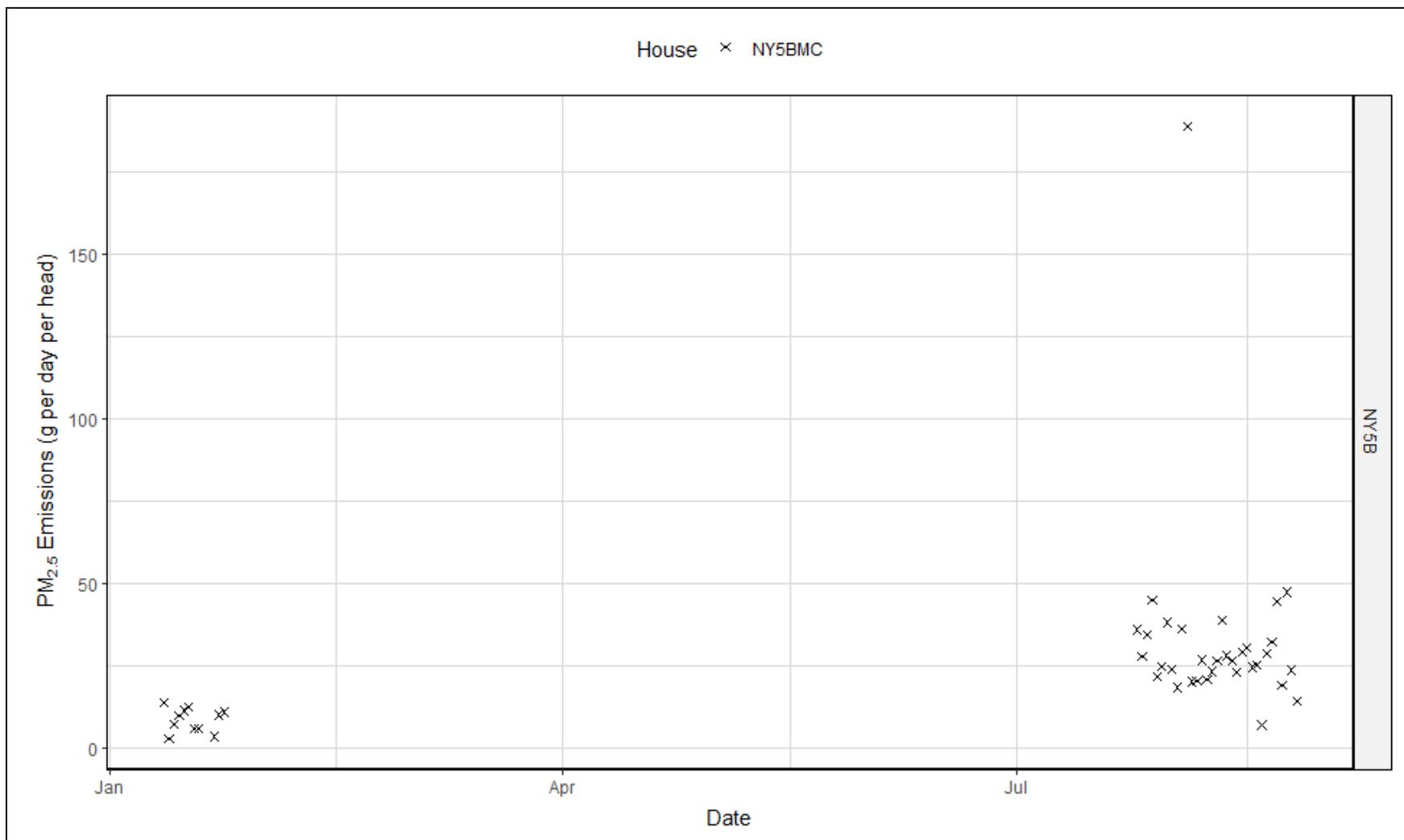


Figure 2.6: PM₁₀ emission time series for milking centers (mg d⁻¹hd⁻¹).

2.1.4 Particulate Matter (PM_{2.5})



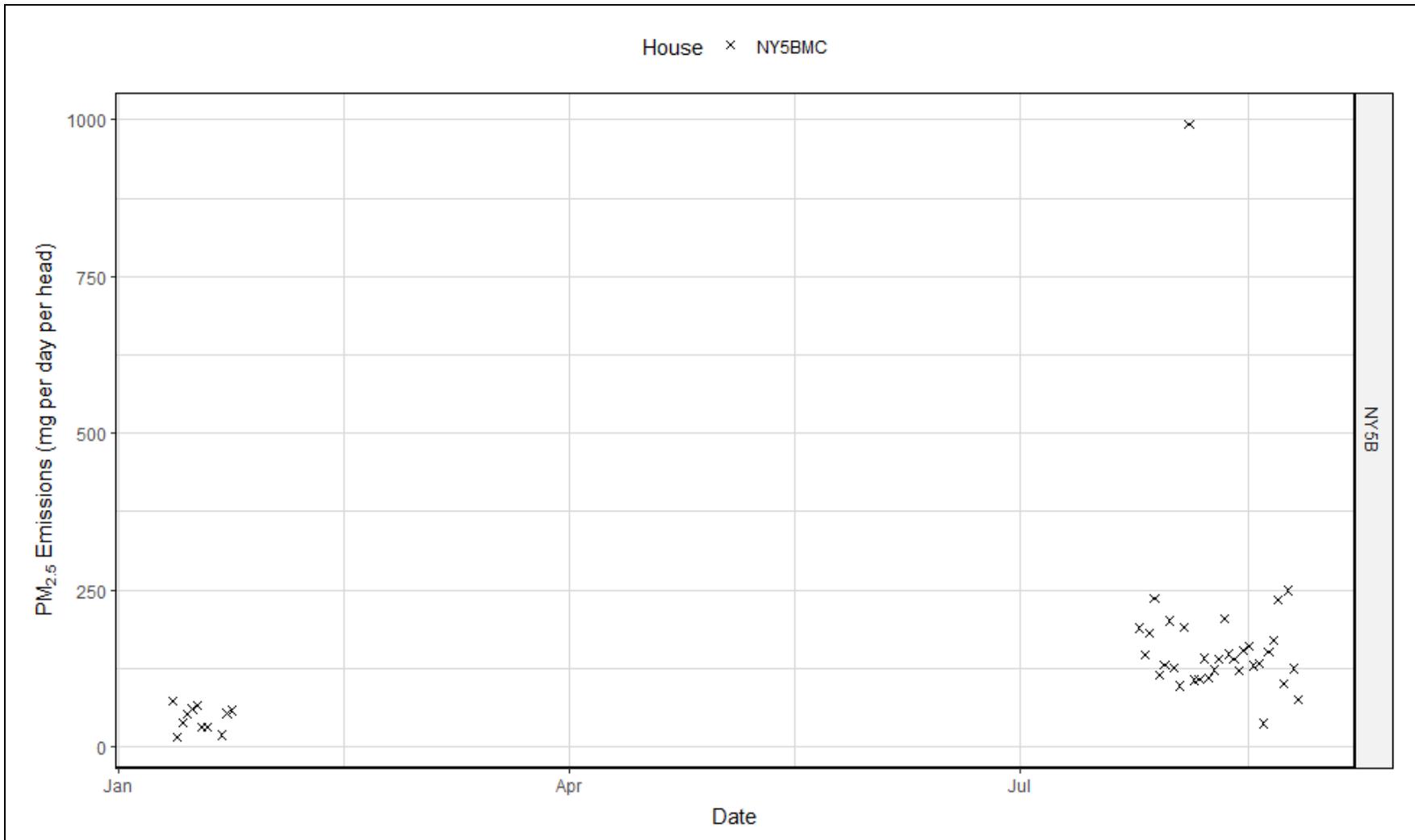


Figure 2.8: PM_{2.5} emission time series for milking centers (mg d⁻¹hd⁻¹).

2.1.5 Total Suspended Particulates (TSP)

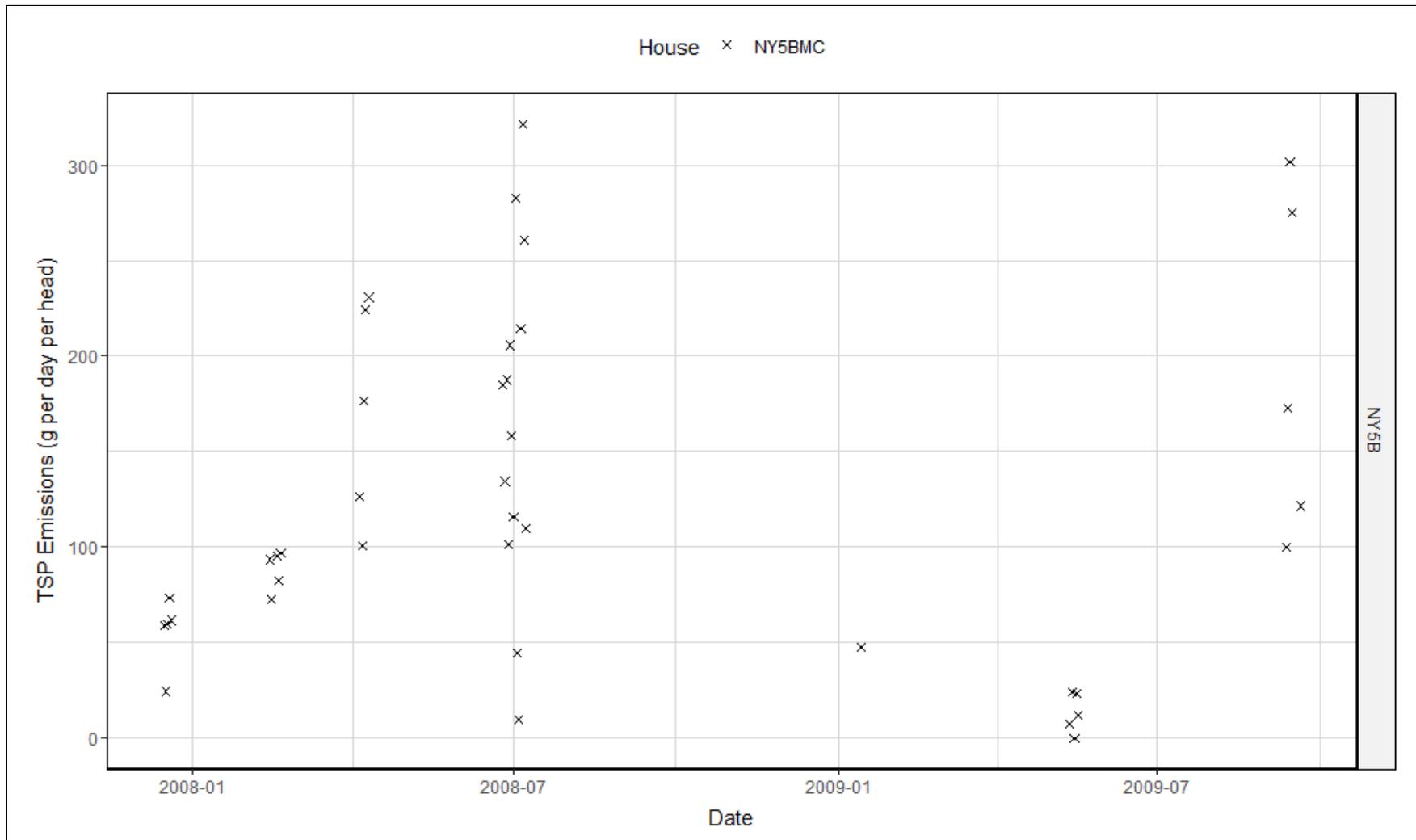


Figure 2.9: TSP emission time series for milking centers (g d⁻¹).

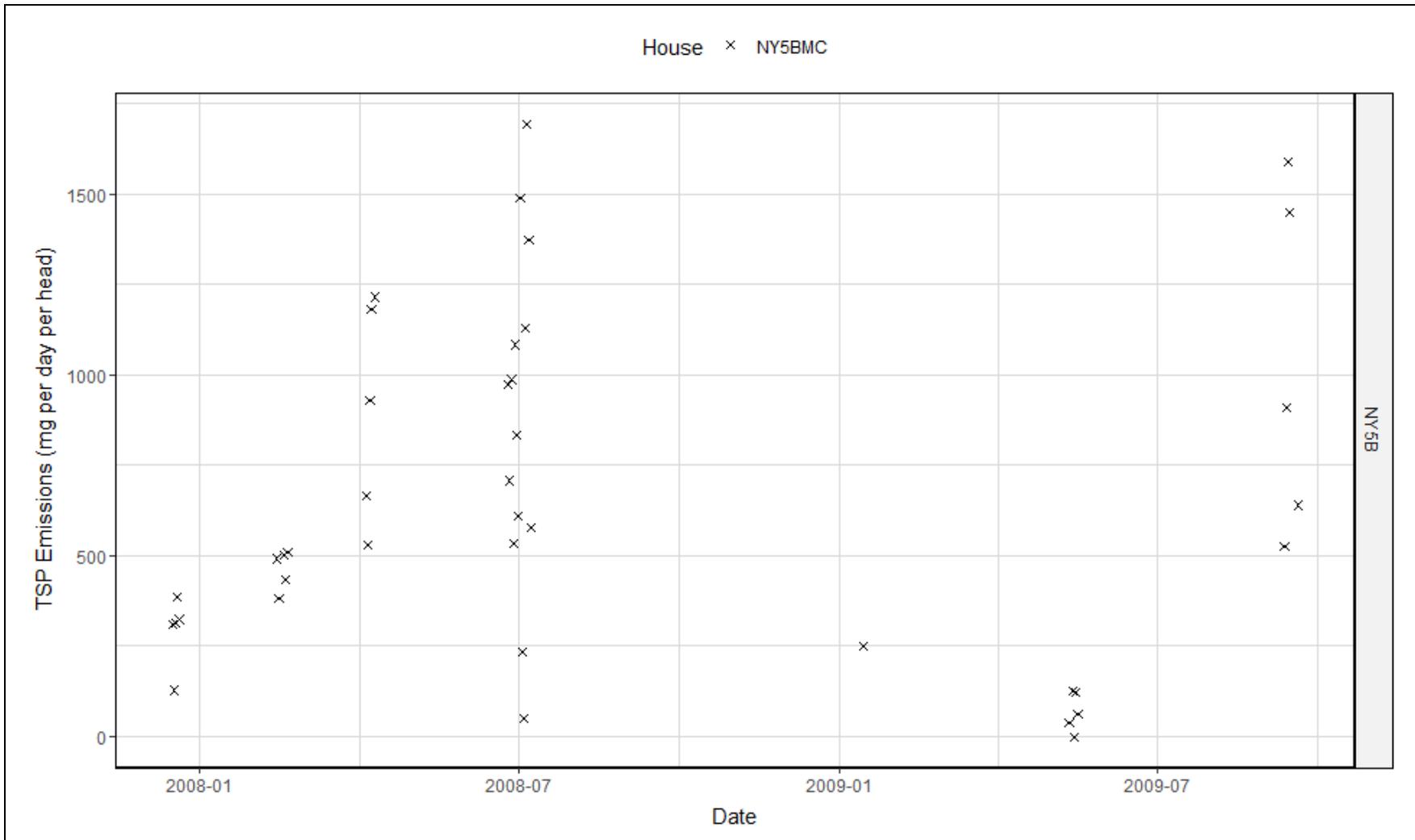


Figure 2.10: TSP emission time series for milking centers ($\text{mg d}^{-1}\text{hd}^{-1}$).

2.2 Environmental

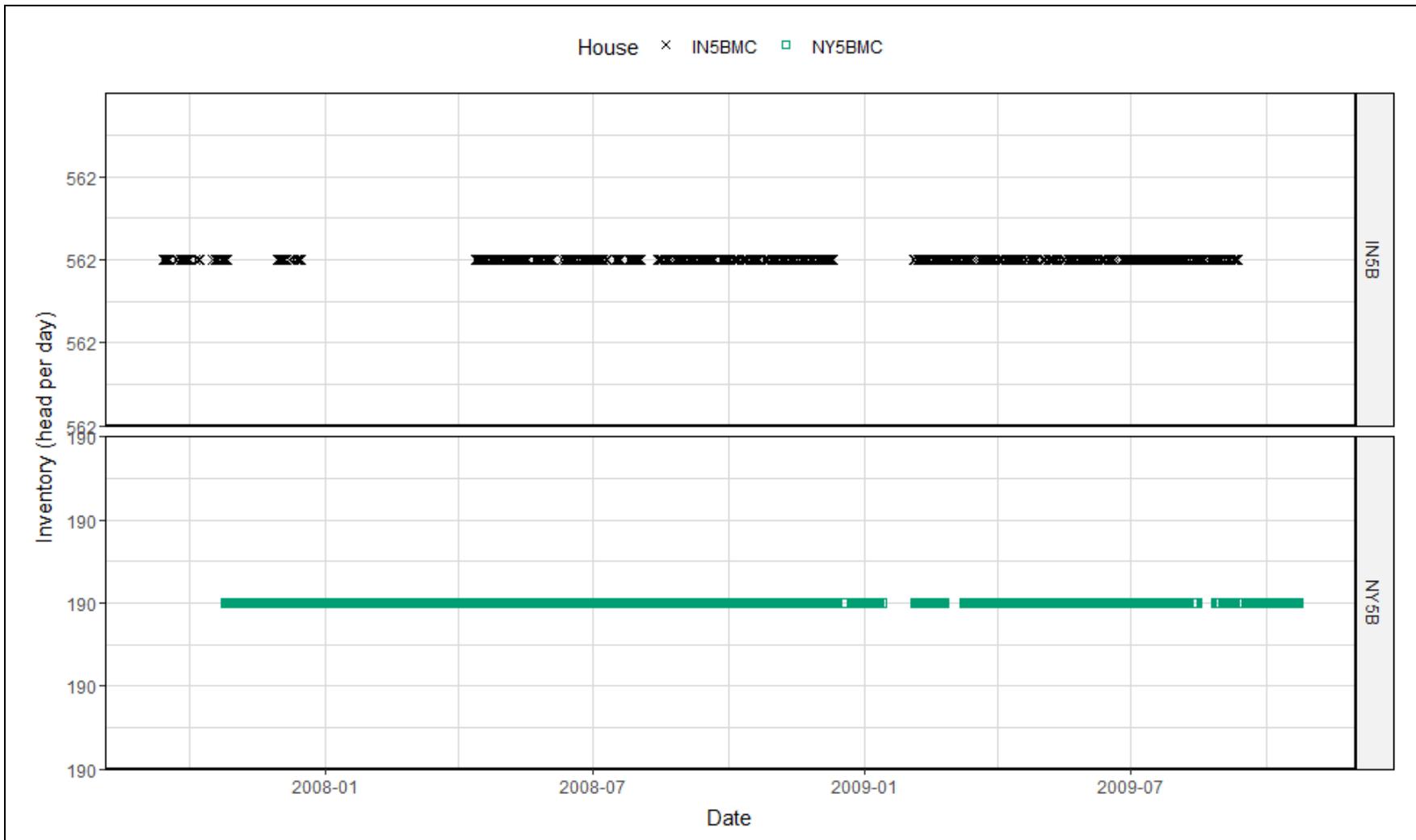


Figure 2.11: Inventory time series for milking centers (hd).

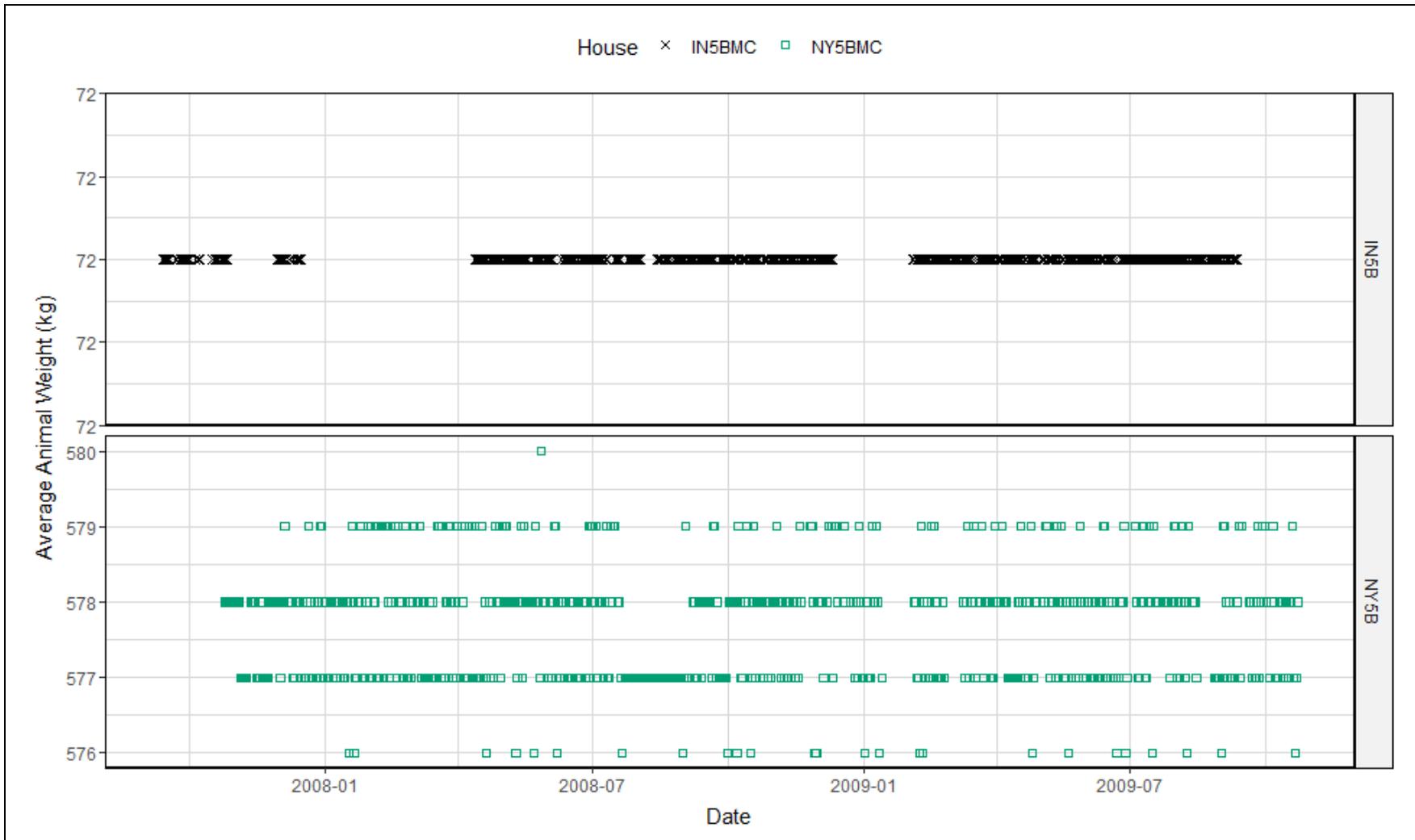


Figure 2.12: Average animal weight emission time series for milking centers (kg).

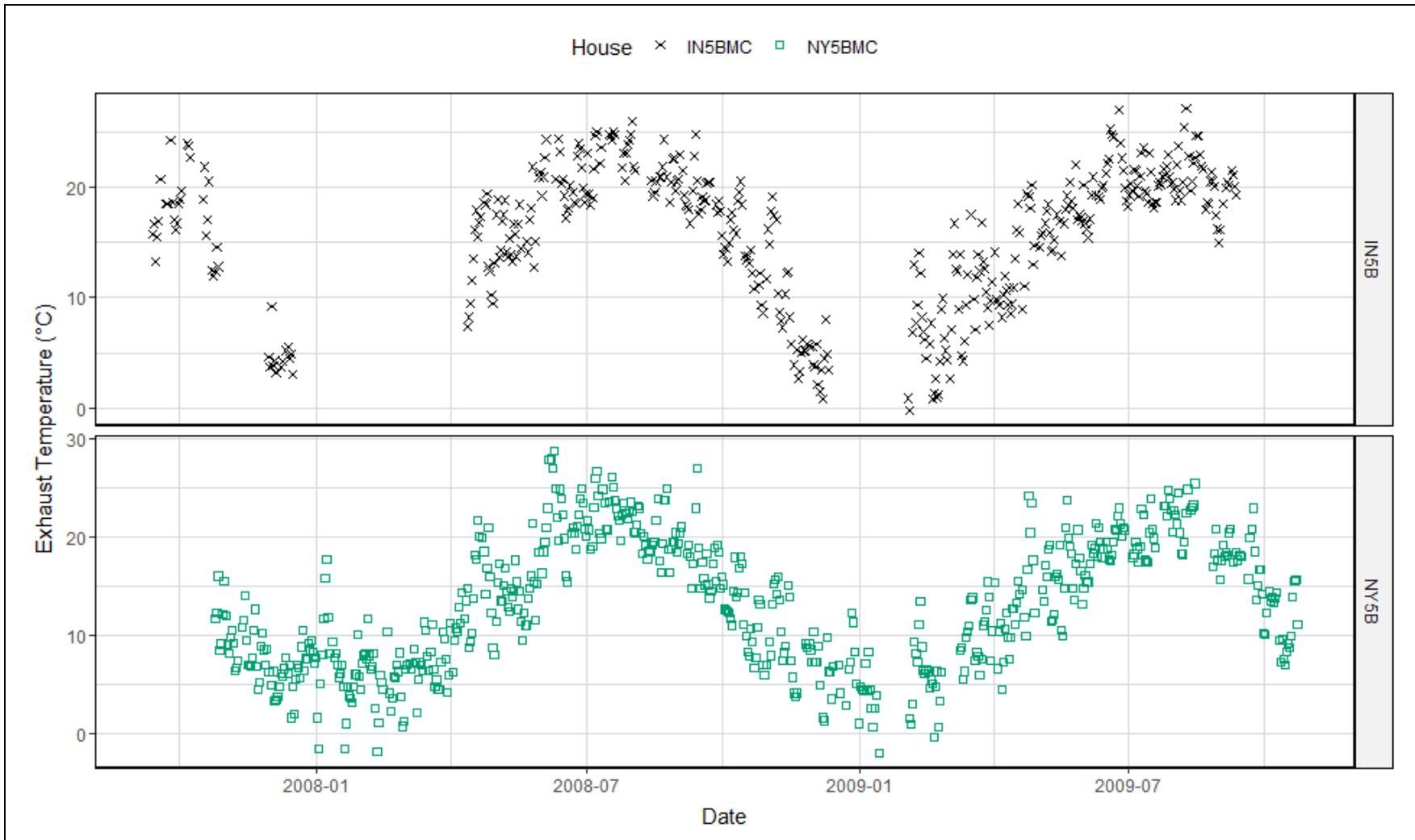


Figure 2.14: Exhaust temperature time series for milking centers (°C).

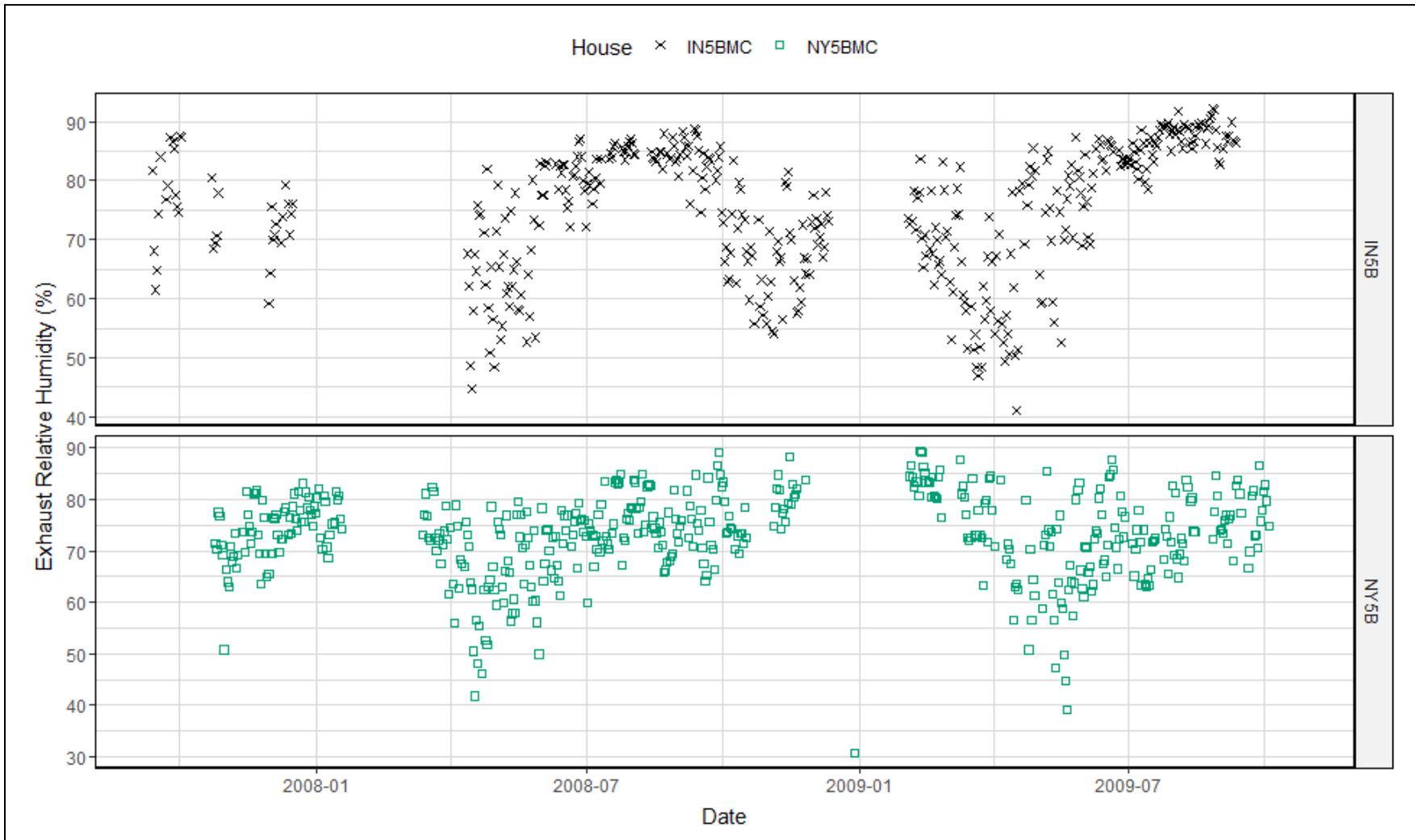


Figure 2.15: Exhaust relative humidity time series for milking centers (%).

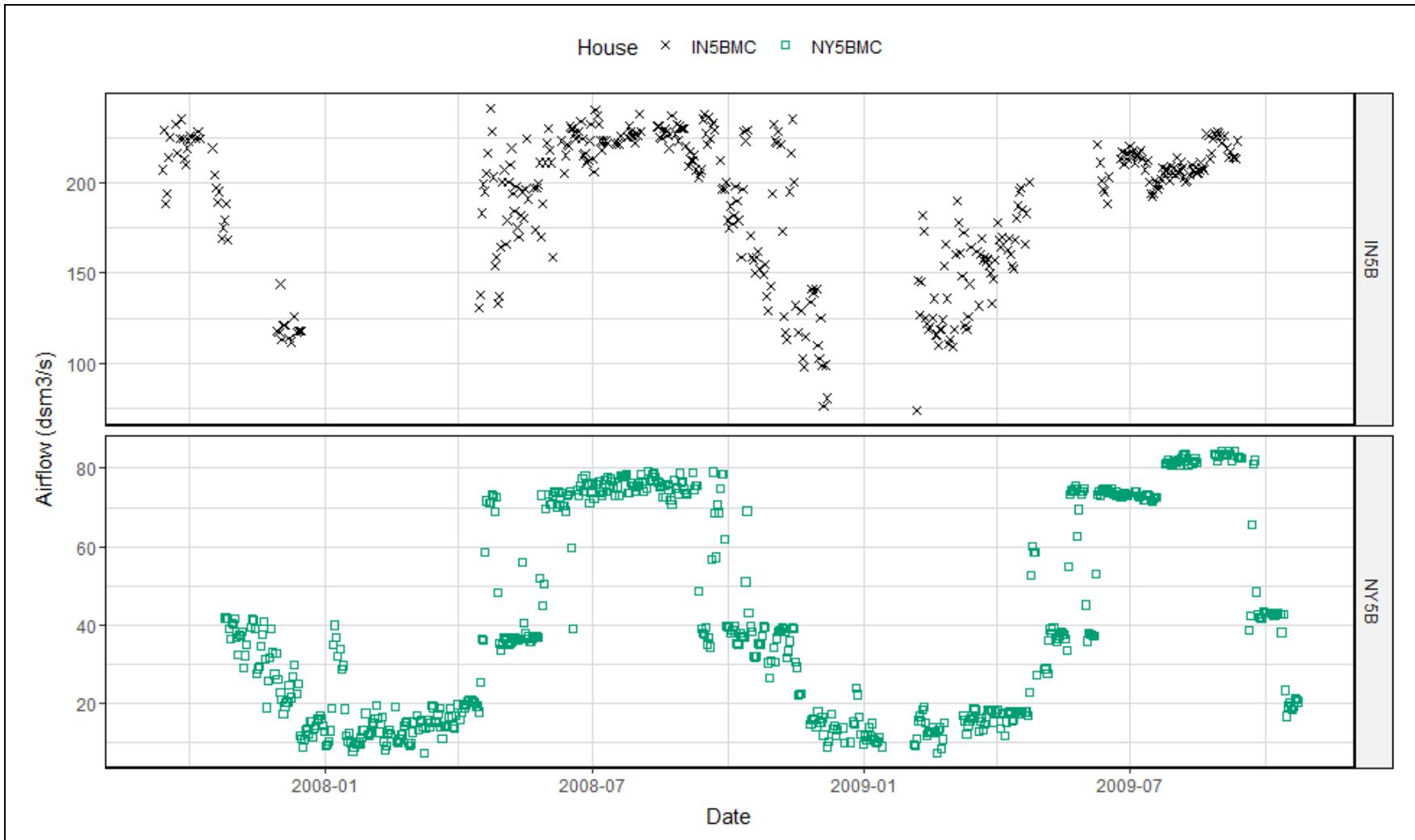


Figure 2.16: Airflow time series for milking centers (dsm³s⁻¹).

2.3 Ambient

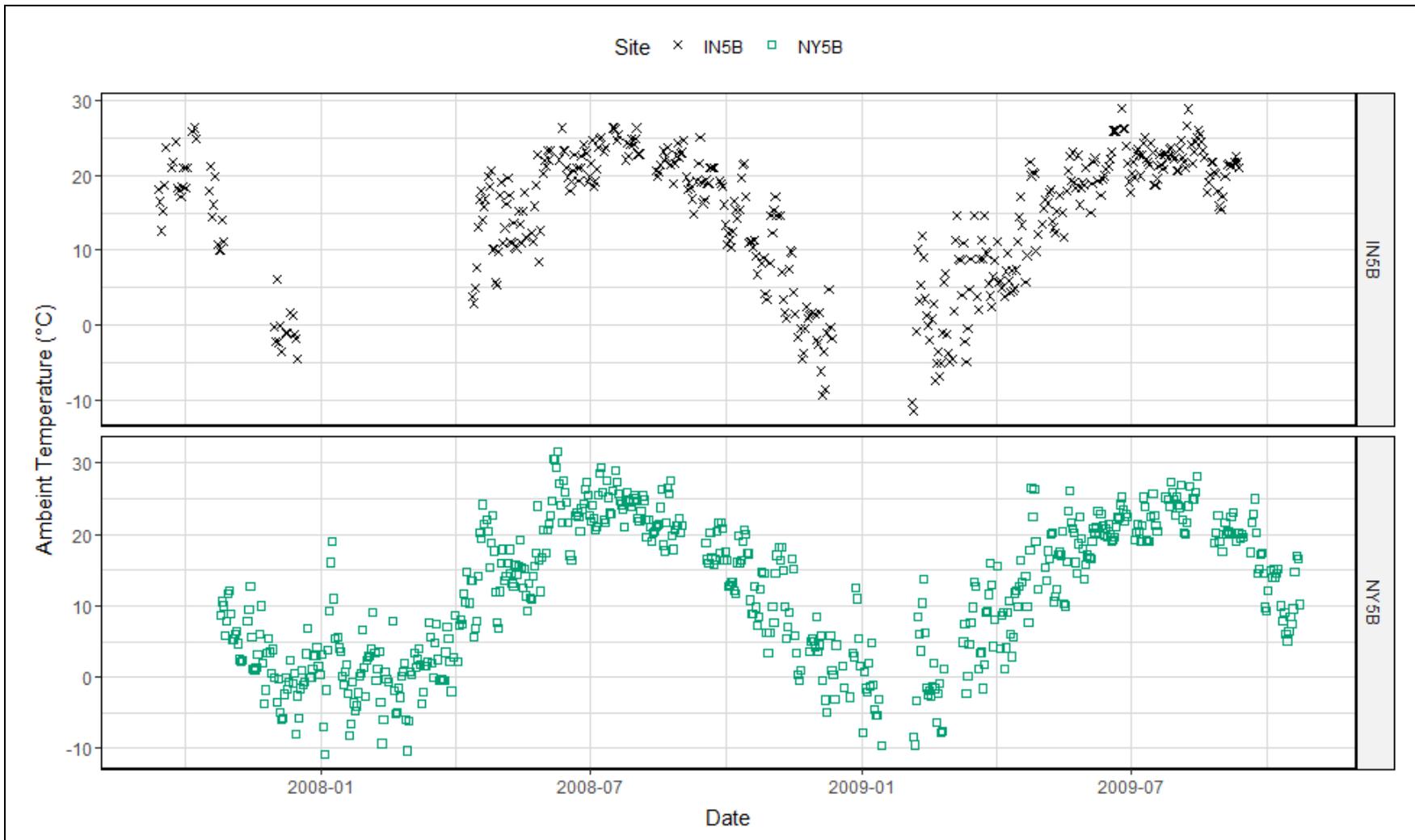


Figure 2.17: Ambient temperature time series for milking centers (°C).

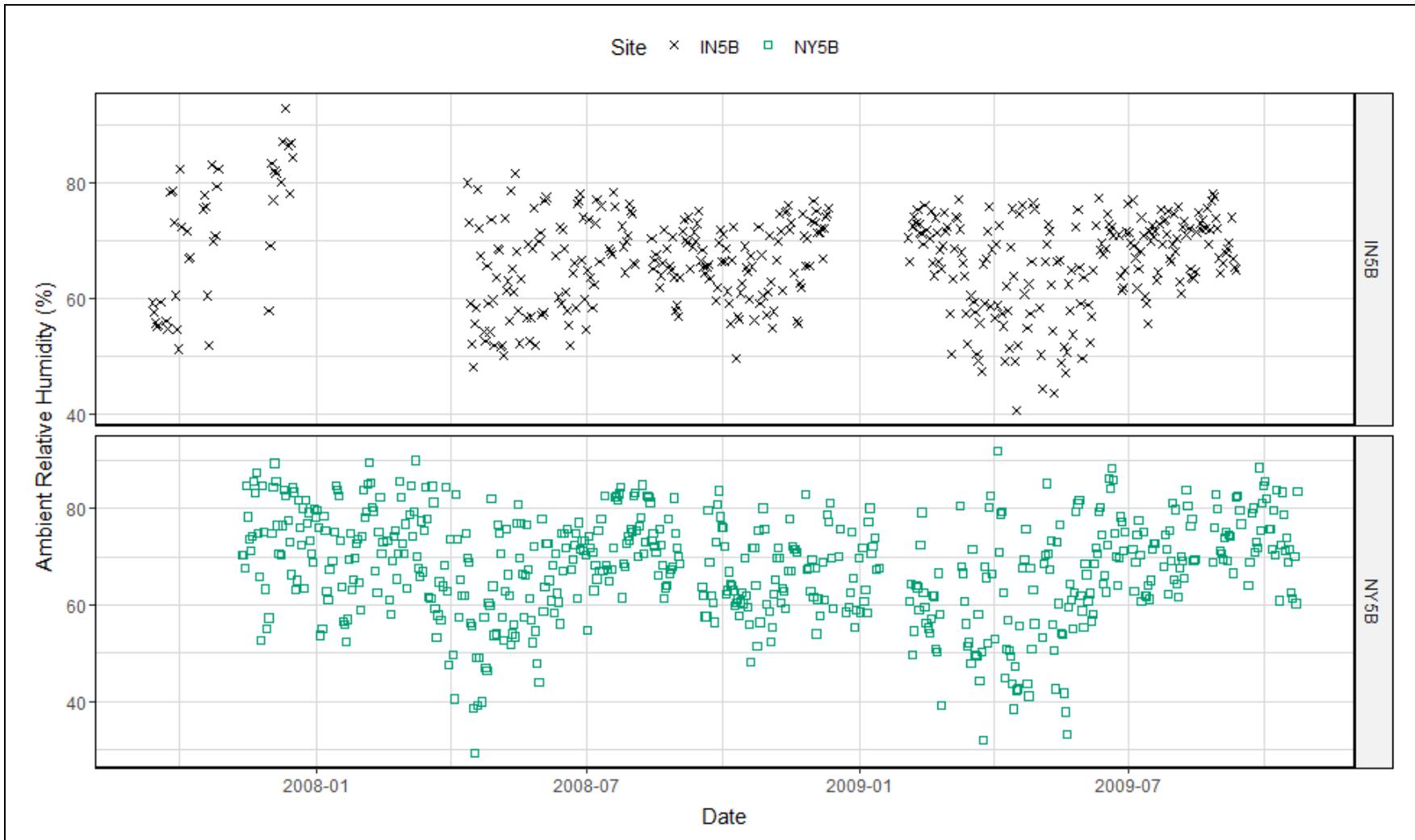


Figure 2.18: Ambient relative humidity time series for milking centers (%).

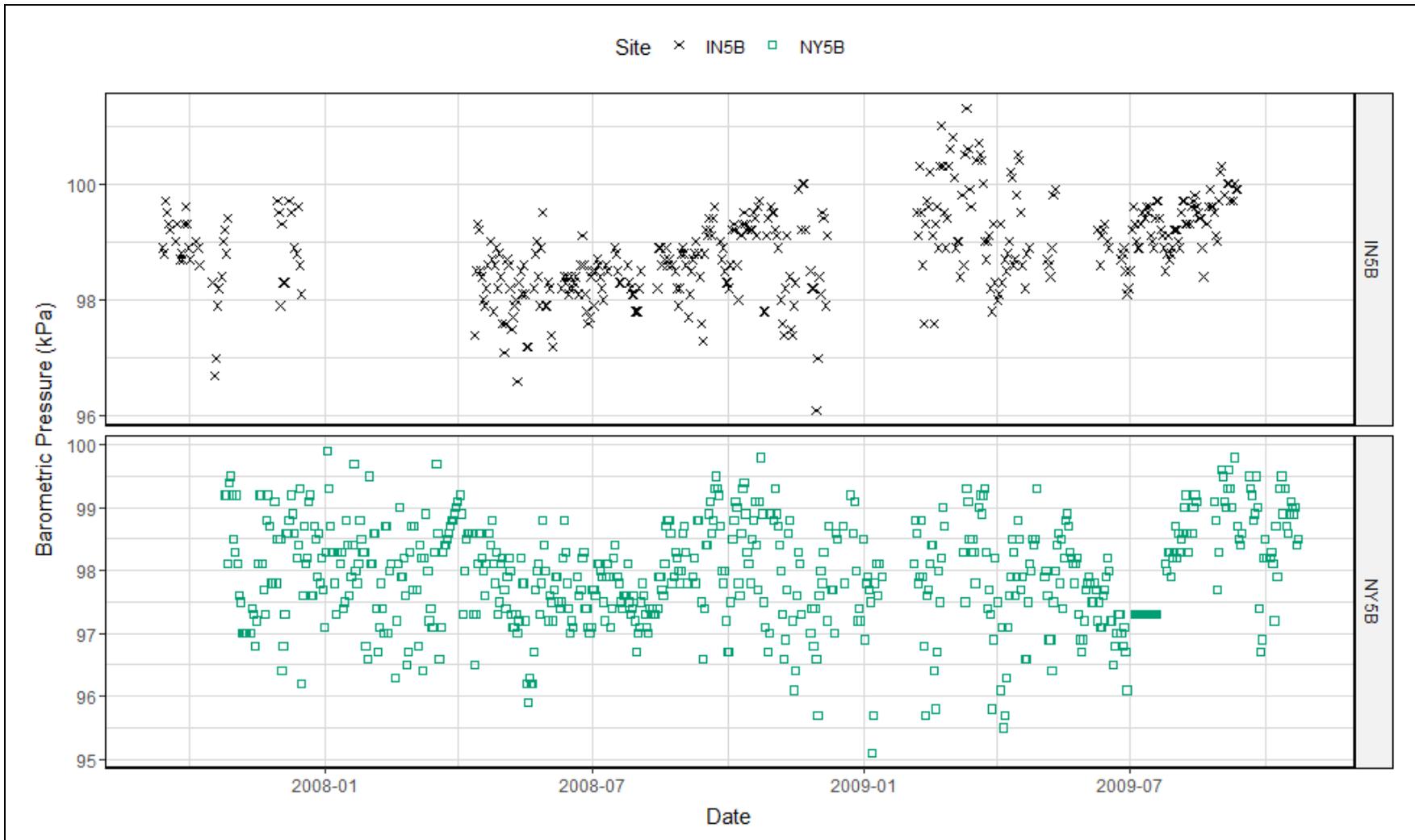


Figure 2.19: Barometric pressure time series for milking centers (kPa).

3 Naturally Ventilated
3.1 Emissions
3.1.1 Ammonia (NH₃)

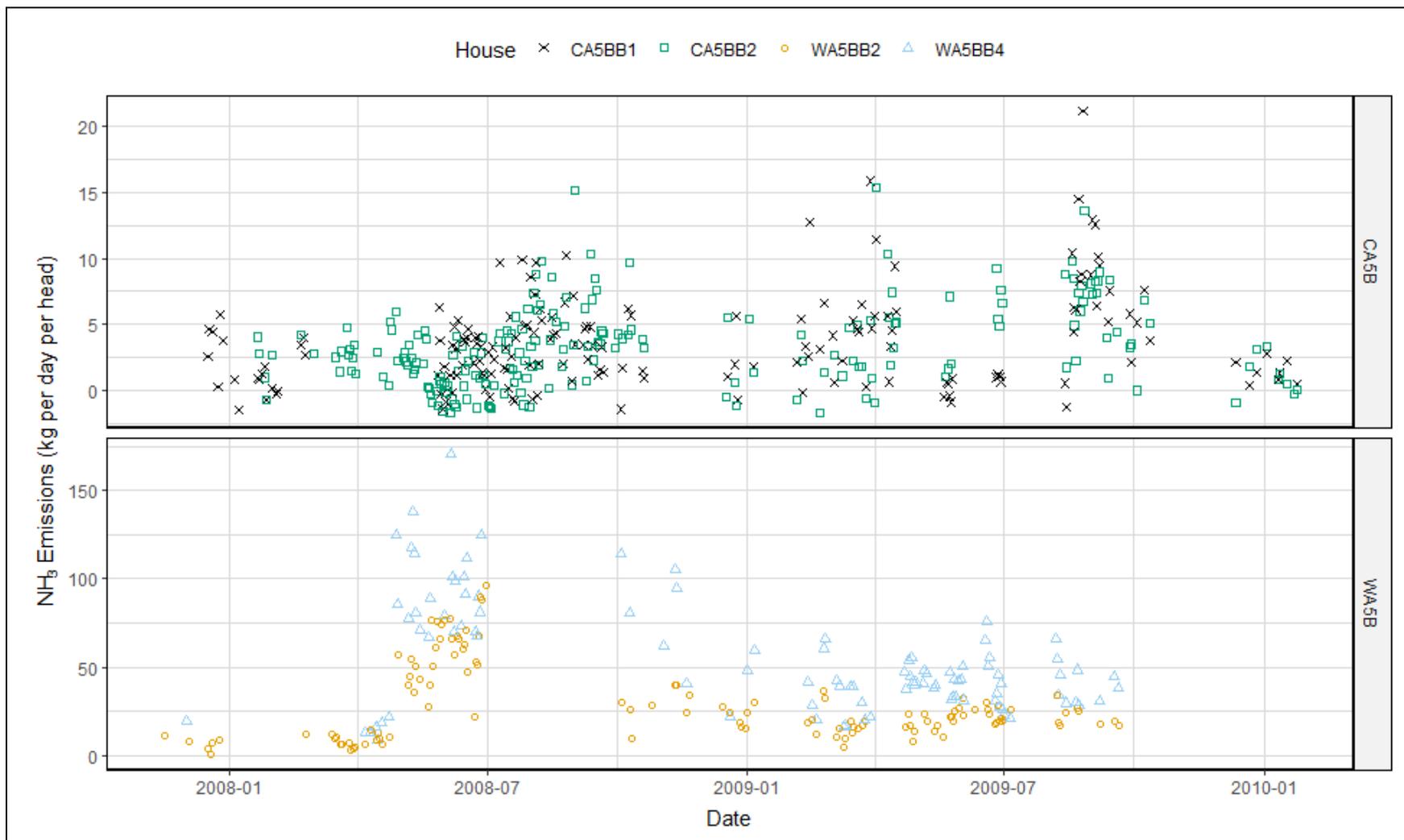


Figure 3.1: NH₃ emission time series for naturally ventilated dairy barns (kg d⁻¹).

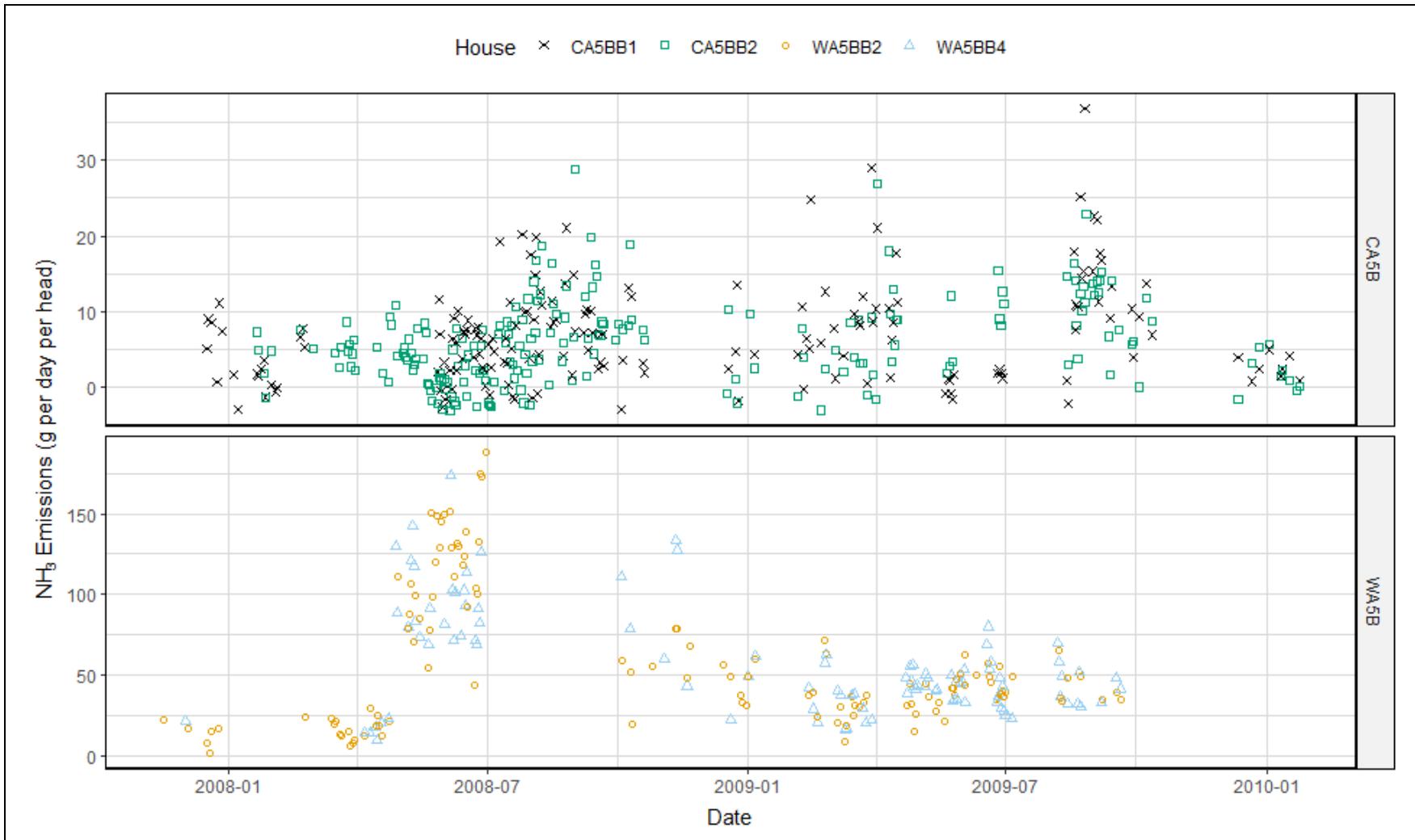


Figure 3.2: NH₃ emission time series for naturally ventilated dairy barns (g d⁻¹hd⁻¹).

3.1.2 Hydrogen Sulfide (H₂S)



Figure 3.3: H₂S emission time series for naturally ventilated dairy barns (g d⁻¹).



Figure 3.4: H₂S emission time series for naturally ventilated dairy barns (mg d⁻¹hd⁻¹).

3.1.3 Particulate Matter (PM₁₀)

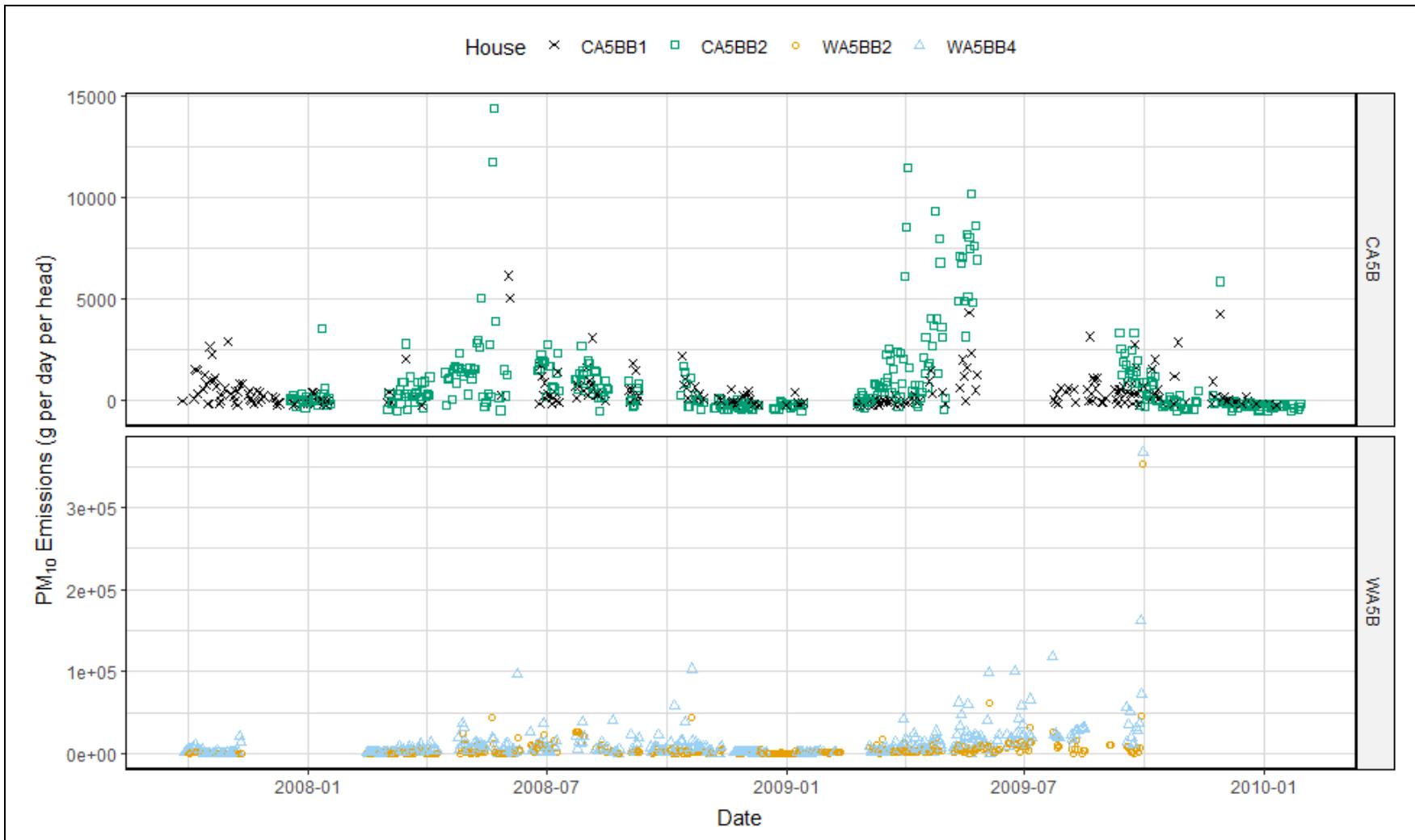


Figure 3.5: PM₁₀ emission time series for naturally ventilated dairy barns (g d⁻¹).

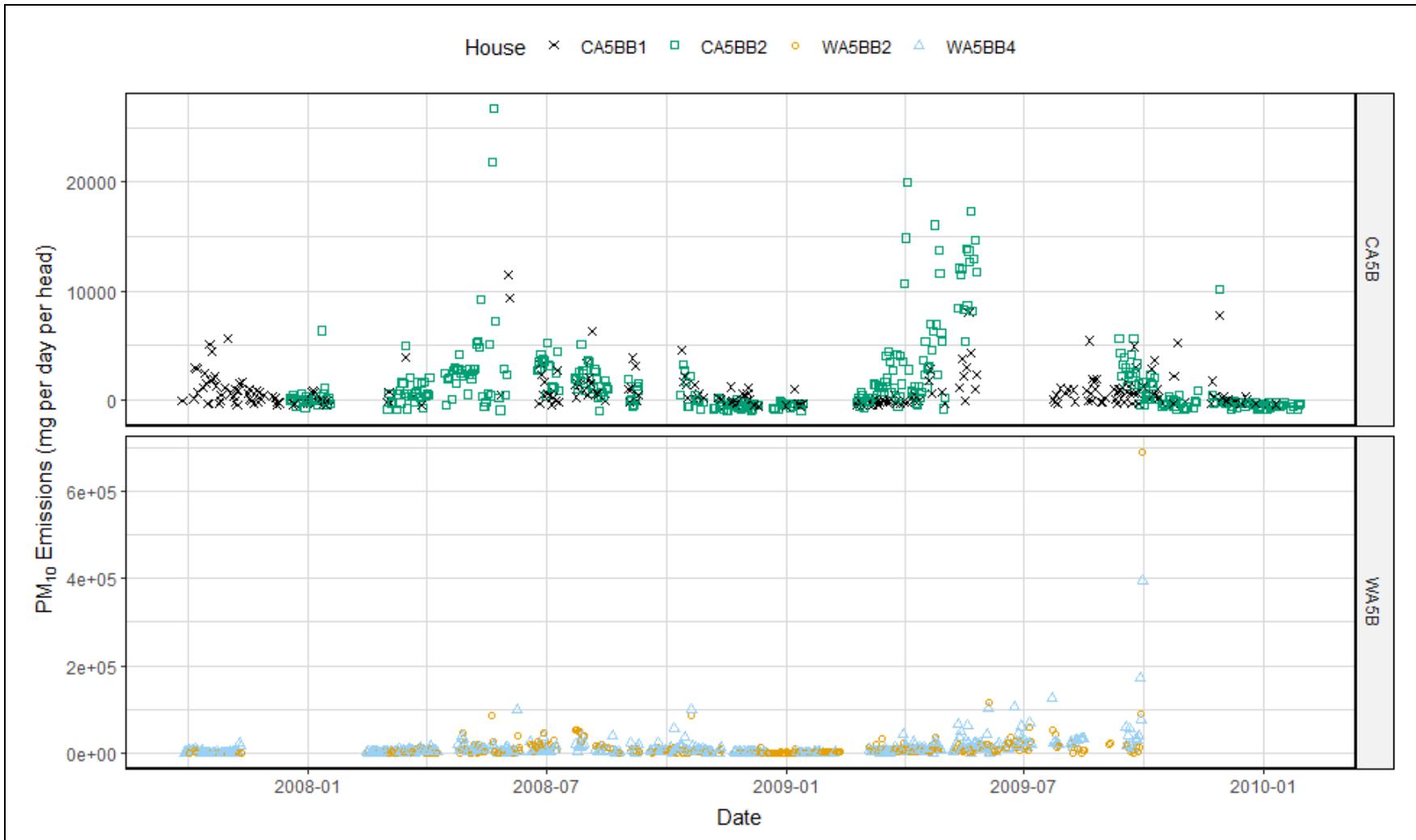


Figure 3.6: PM₁₀ emission time series for naturally ventilated dairy barns (mg d⁻¹hd⁻¹).

3.1.4 Particulate Matter (PM_{2.5})

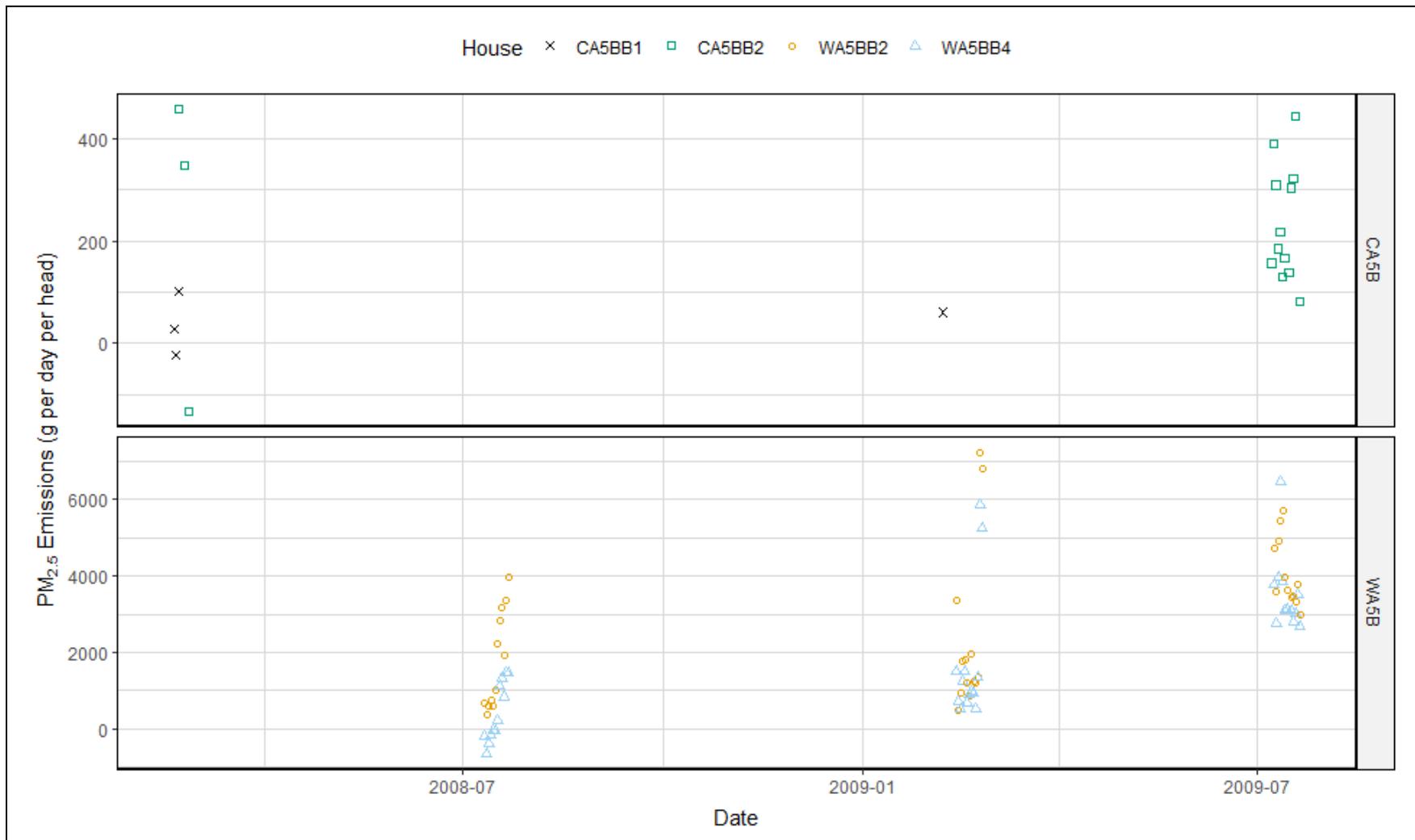
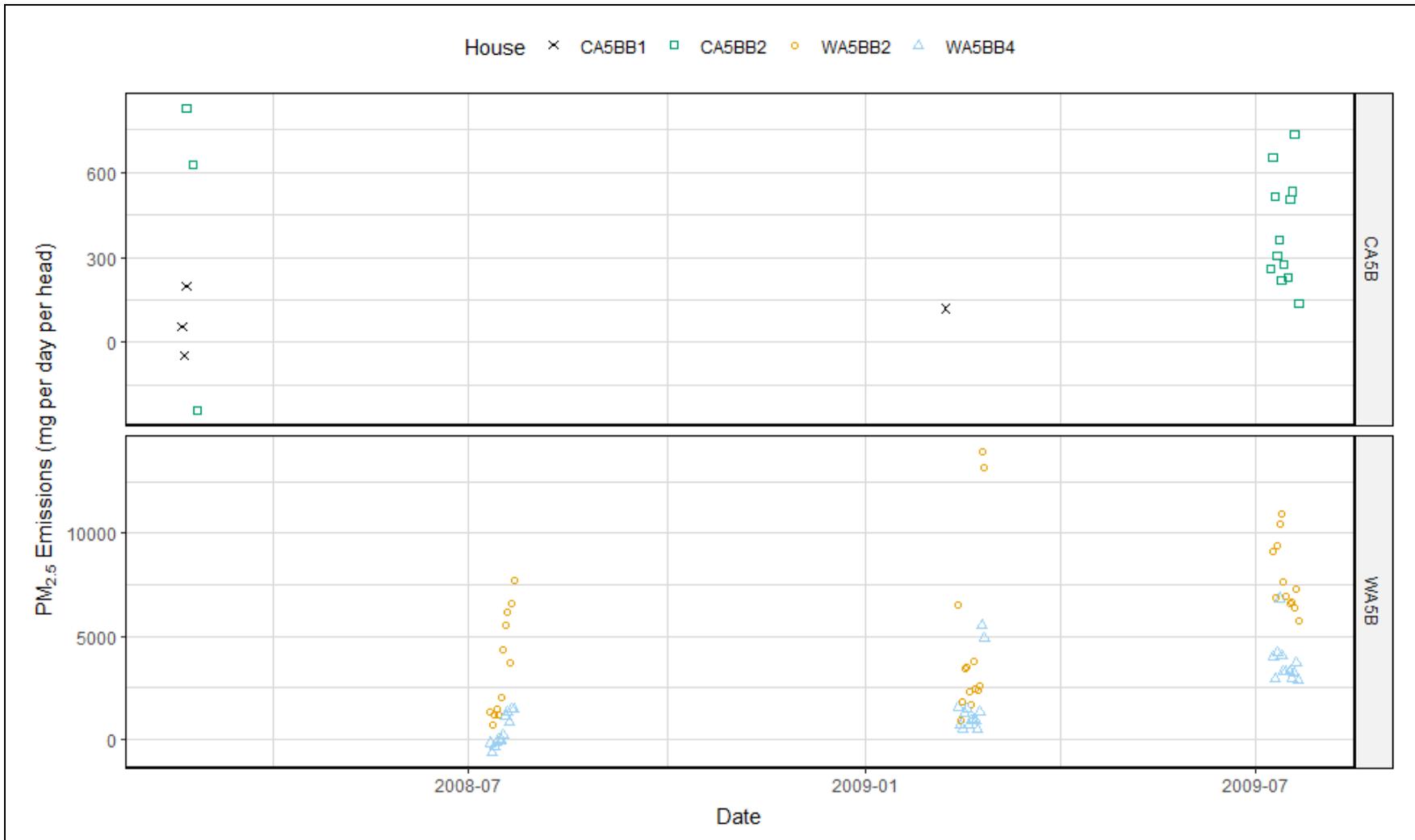


Figure 3.7: PM_{2.5} emission time series for naturally ventilated dairy barns (g d⁻¹).



3.1.5 Total Suspended Particulates (TSP)

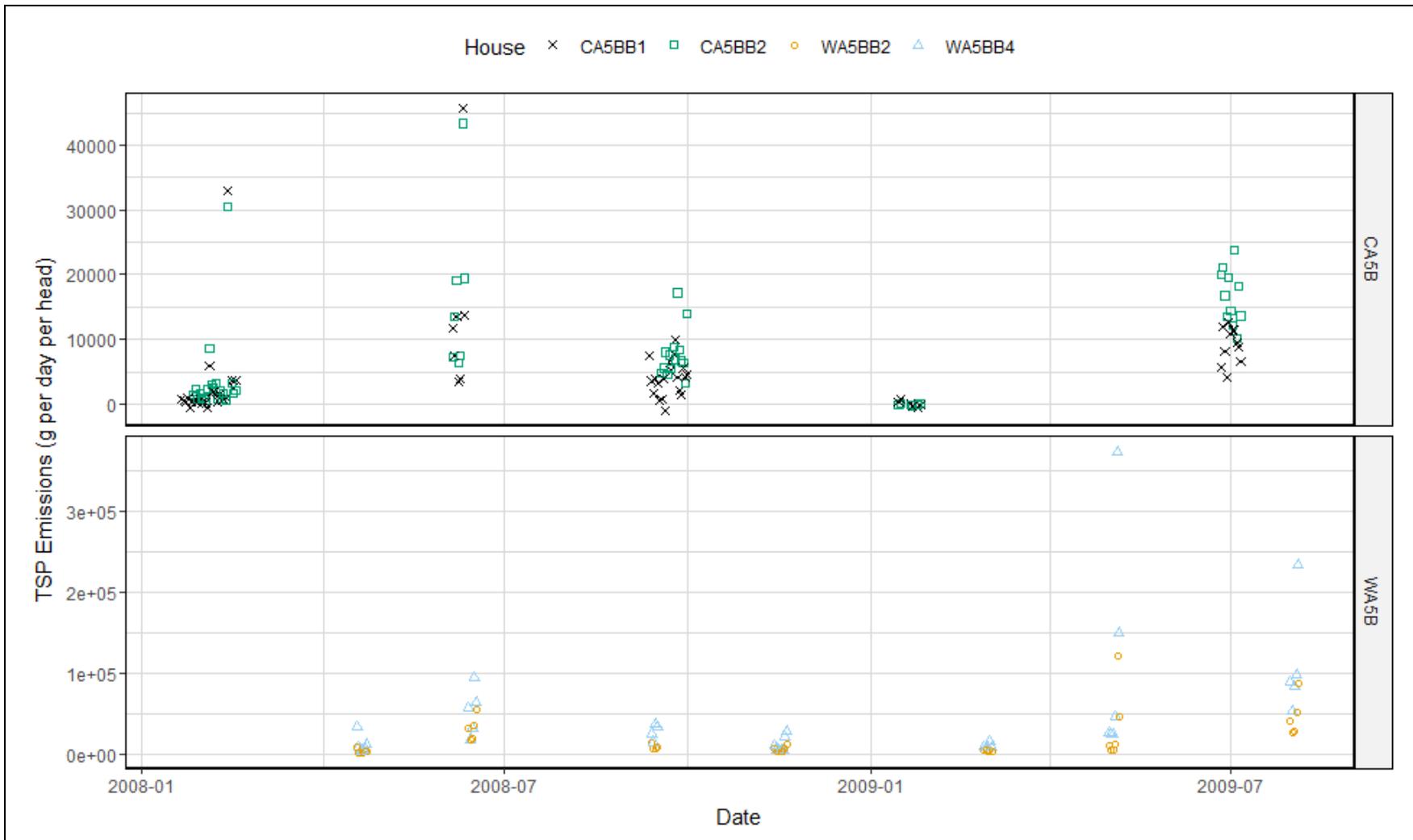


Figure 3.9: TSP emission time series for naturally ventilated dairy barns (g d^{-1}).

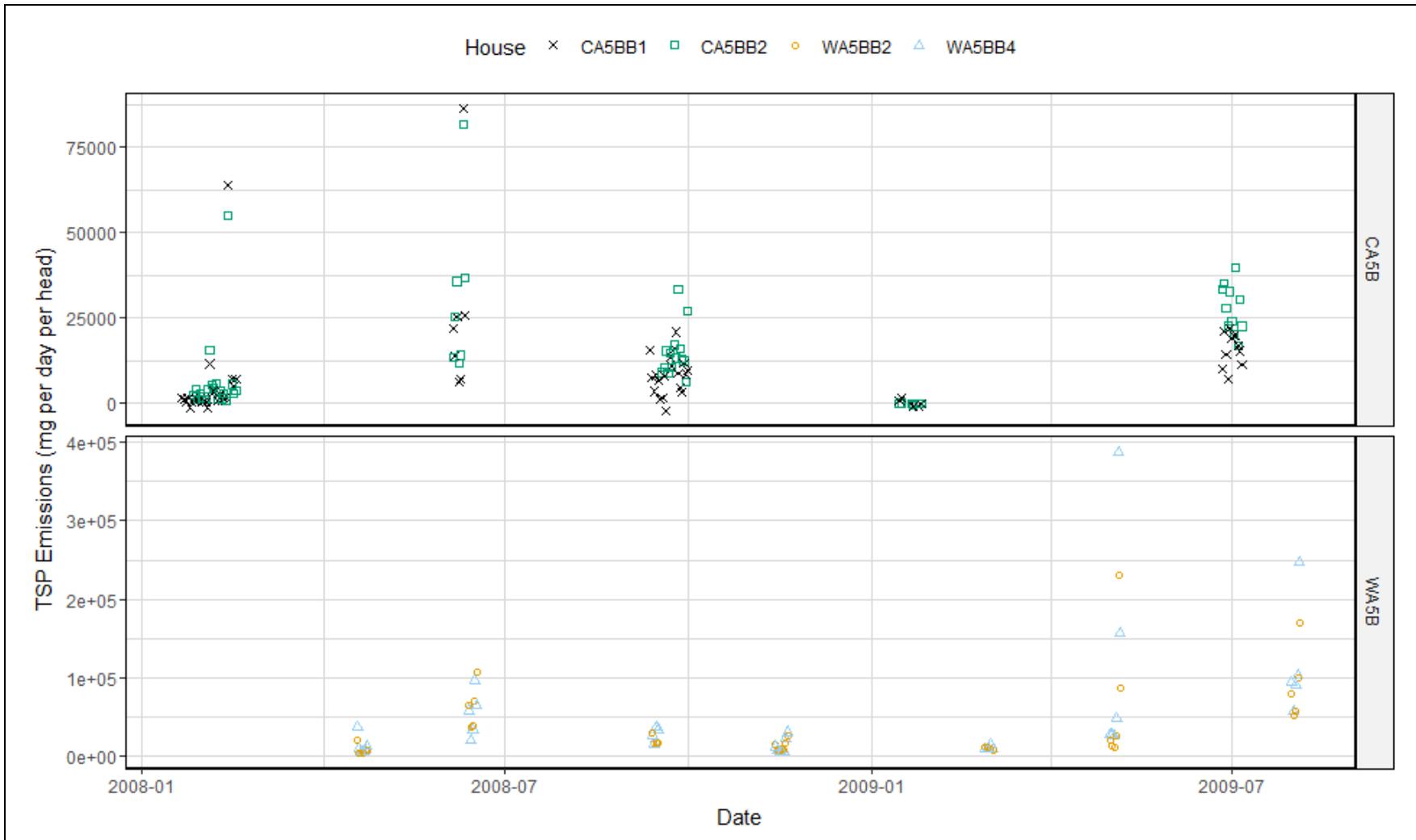


Figure 3.10: TSP emission time series for naturally ventilated dairy barns ($\text{mg d}^{-1}\text{hd}^{-1}$).

3.2 Environmental

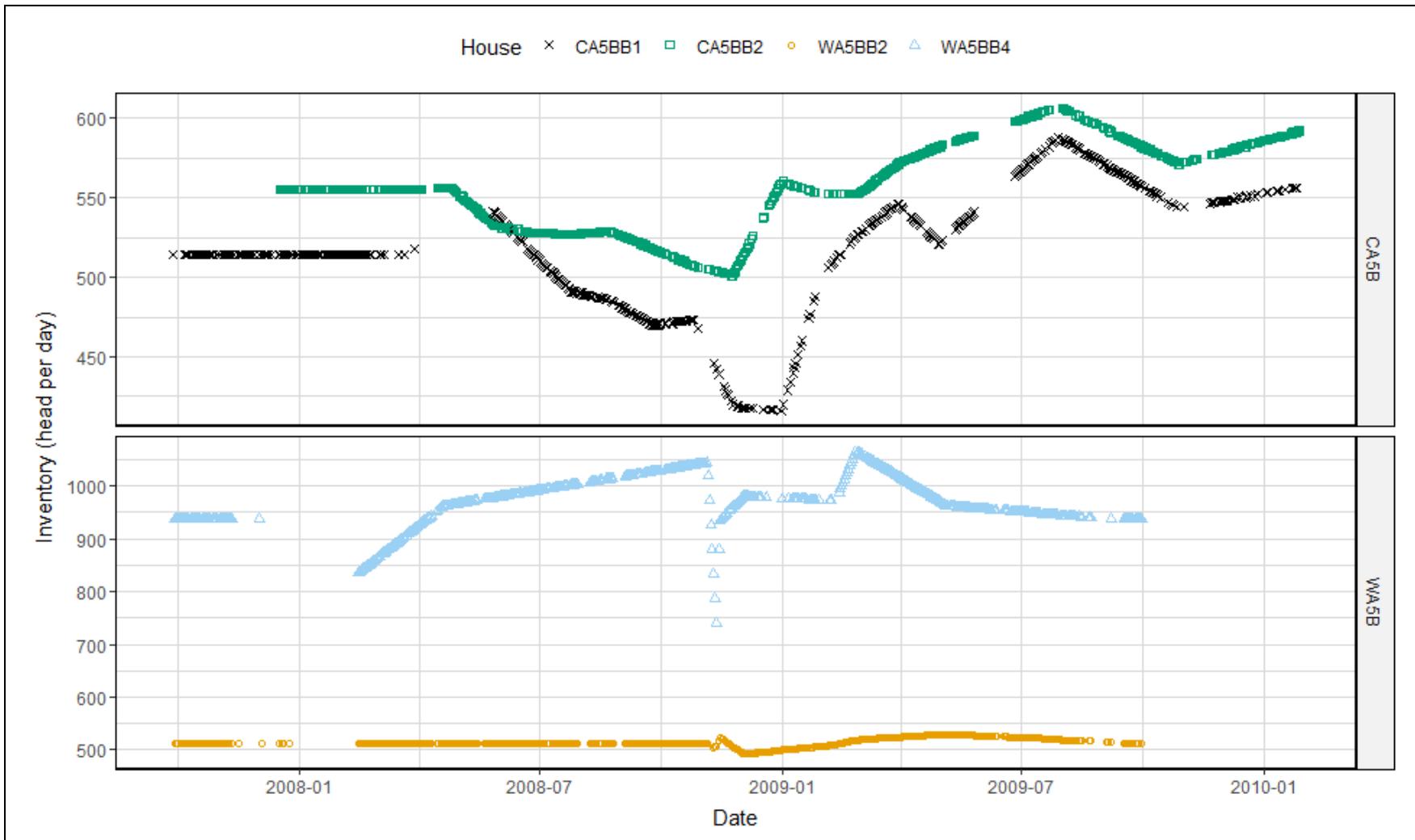


Figure 3.11: Inventory time series for naturally ventilated dairy barns (hd).

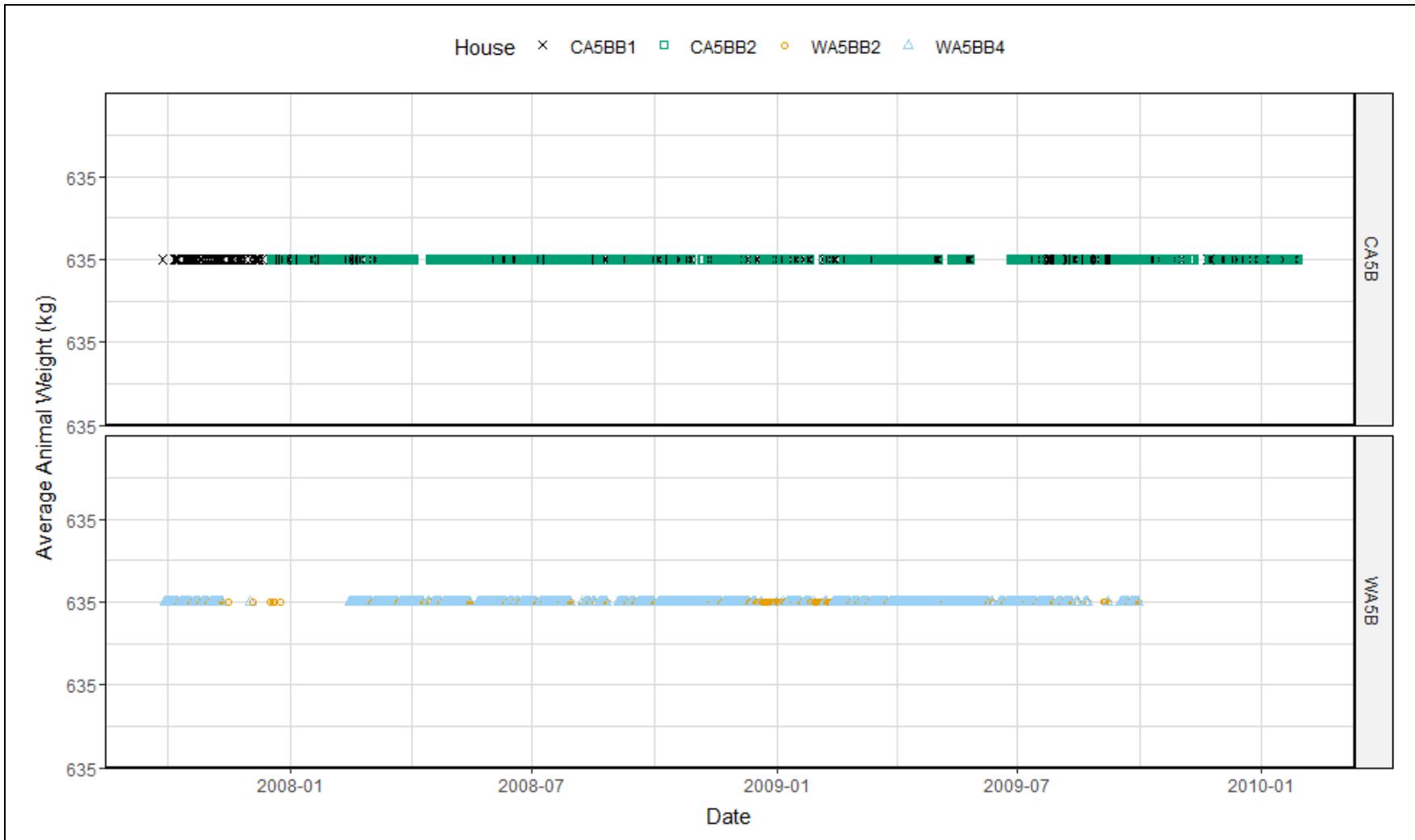


Figure 3.12: Average animal weight emission time series for naturally ventilated dairy barns (kg).

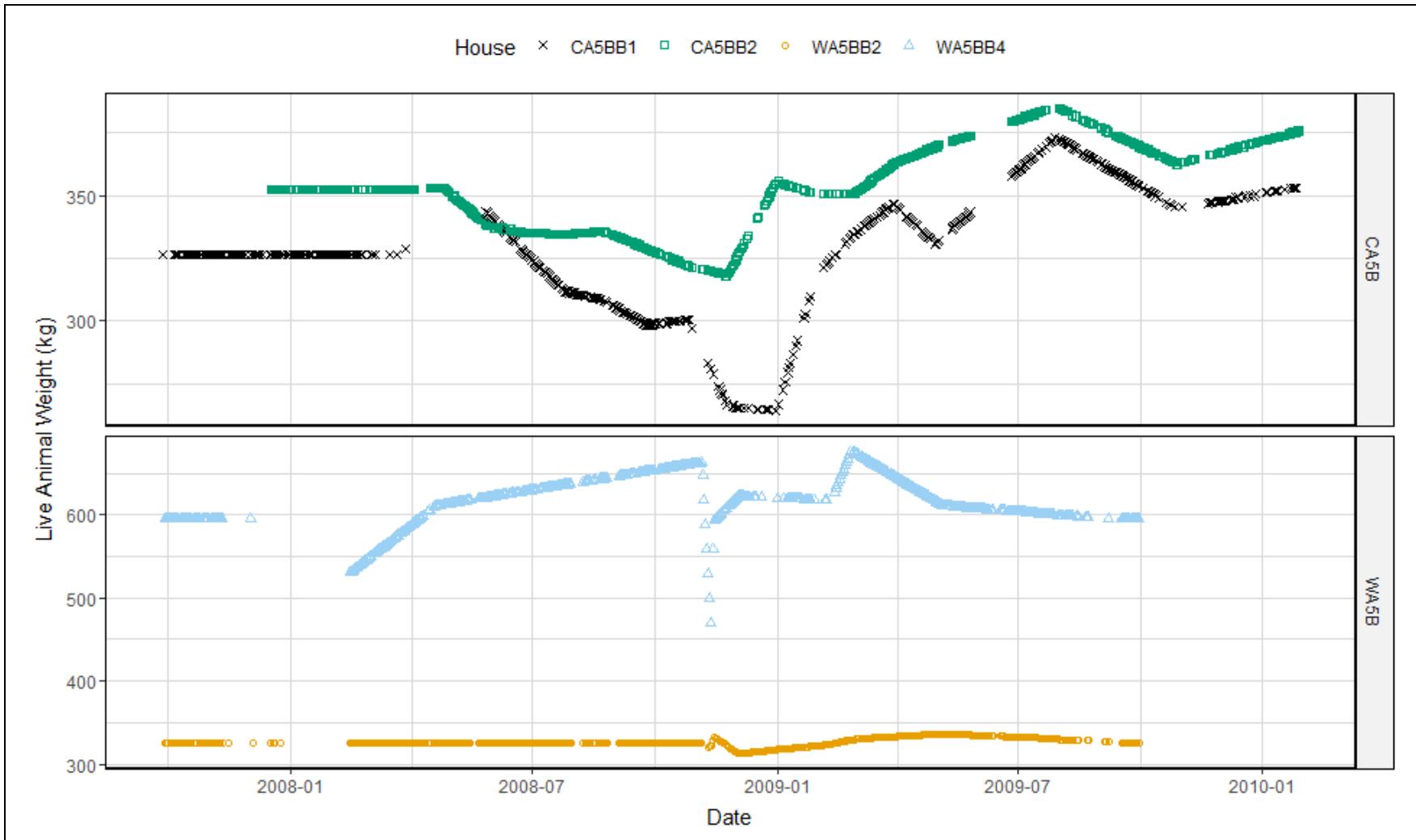


Figure 3.13: Live animal weight time series for naturally ventilated dairy barns (kg).

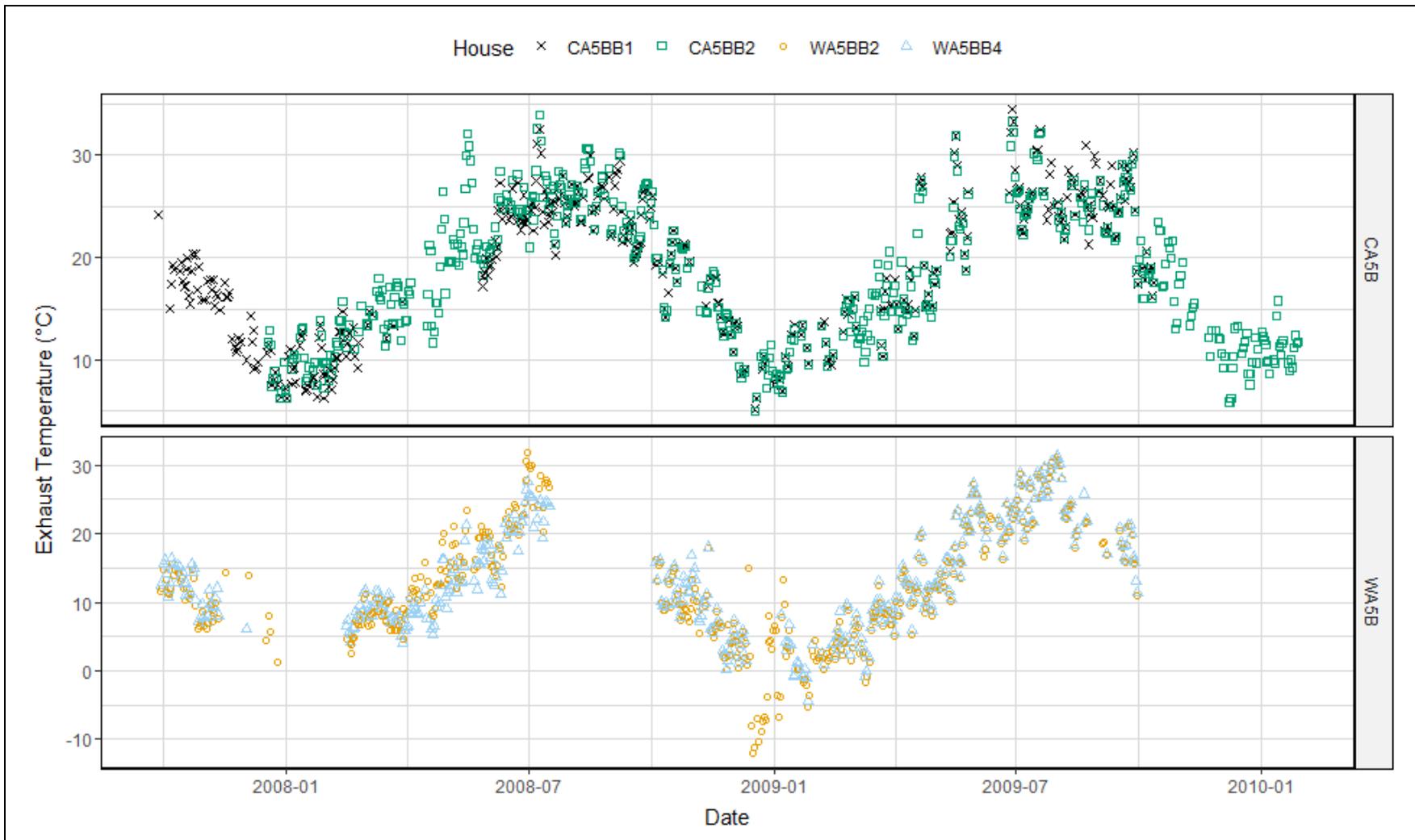


Figure 3.14: Exhaust temperature time series for naturally ventilated dairy barns (°C).

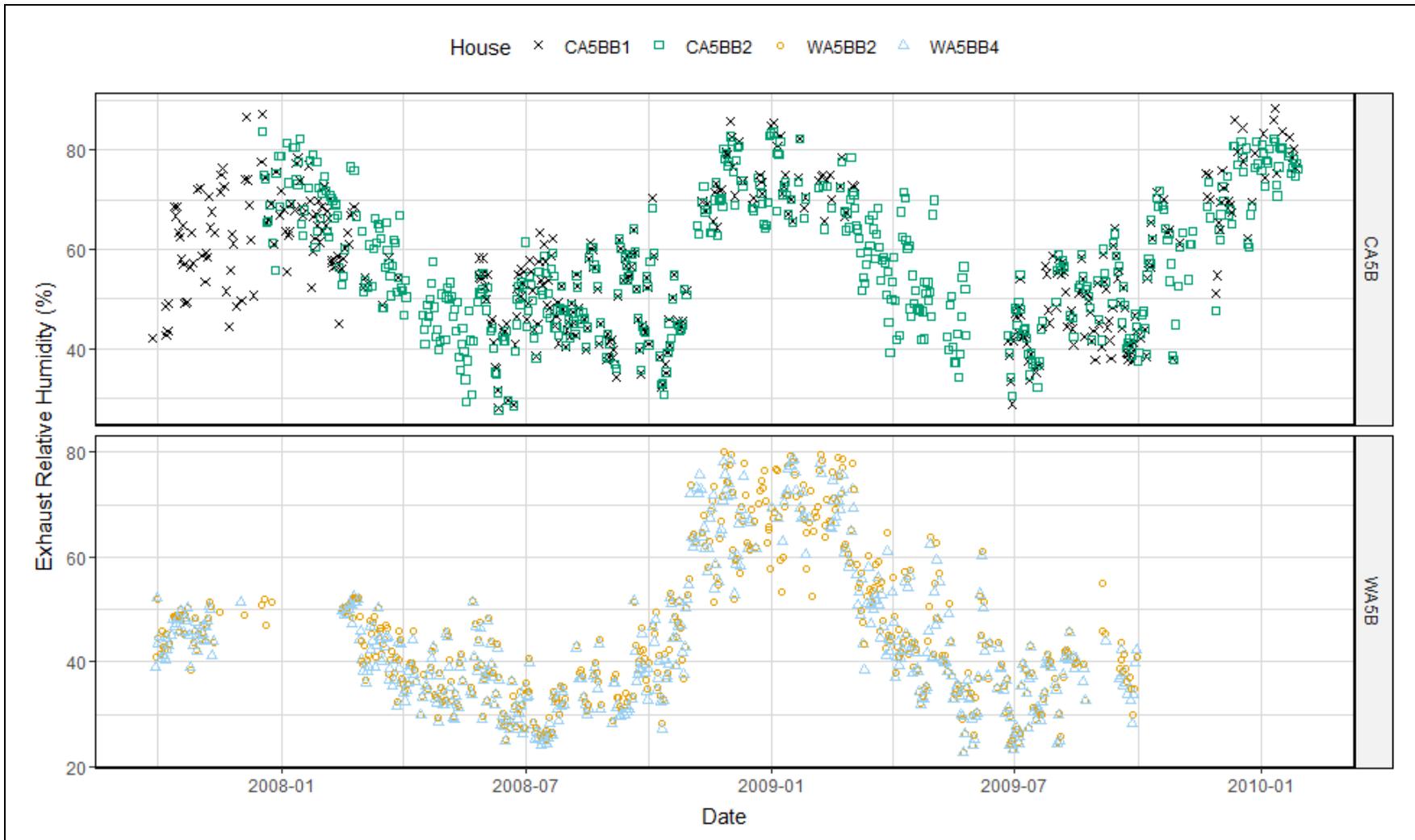


Figure 3.15: Exhaust relative humidity time series for naturally ventilated dairy barns (%).

3.3 Ambient

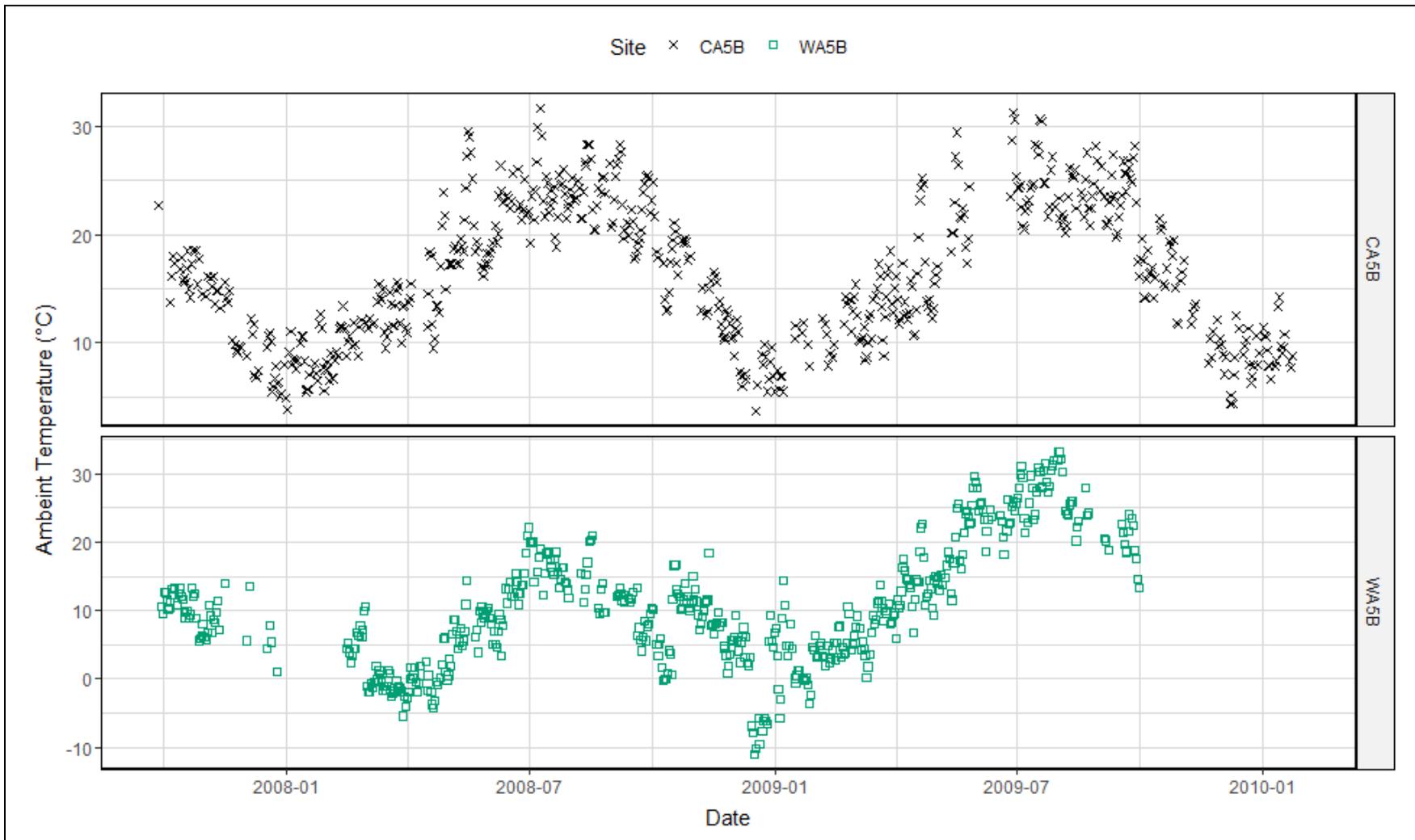


Figure 3.16: Ambient temperature time series for naturally ventilated dairy barns (°C).

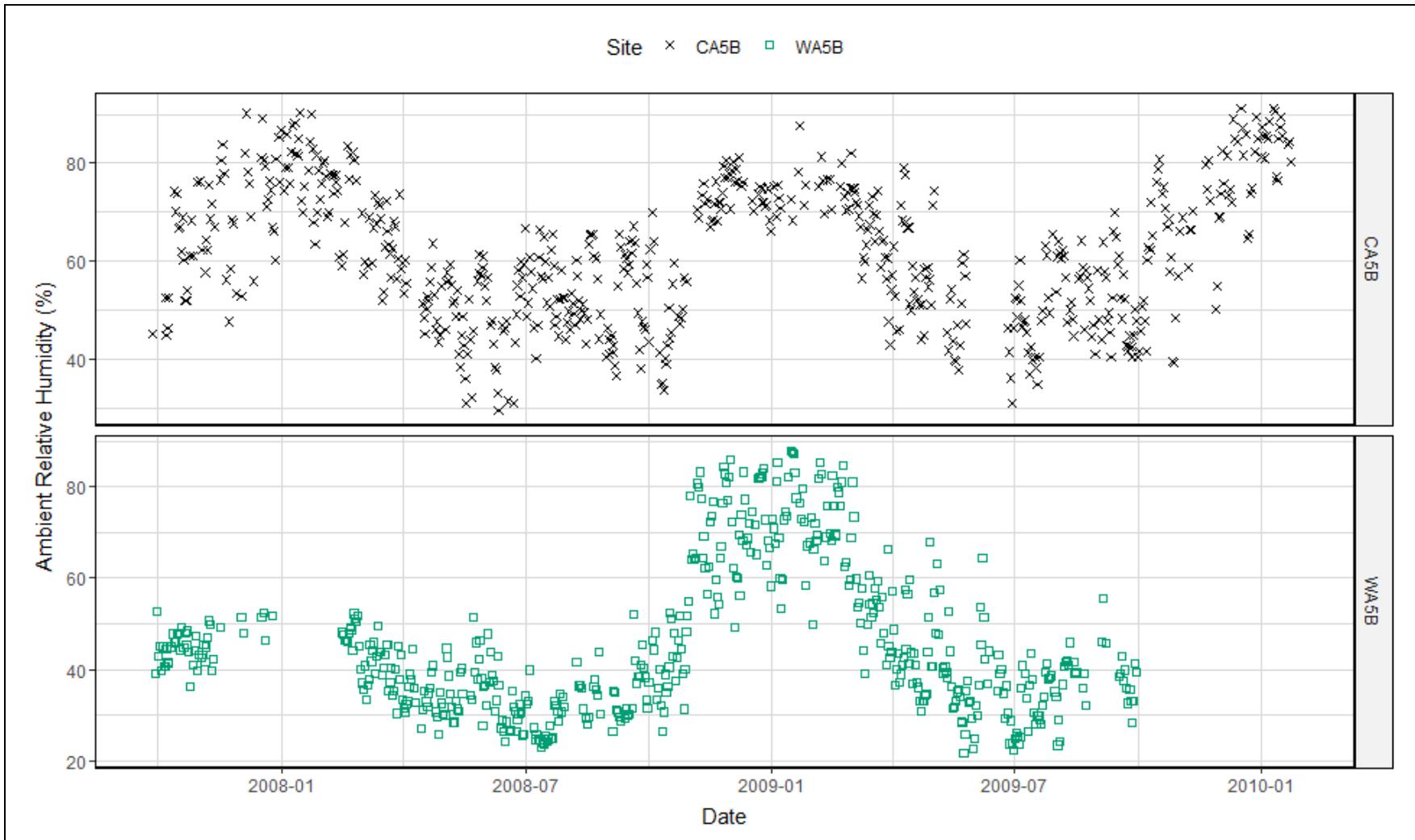


Figure 3.17: Ambient relative humidity time series for naturally ventilated dairy barns (%).

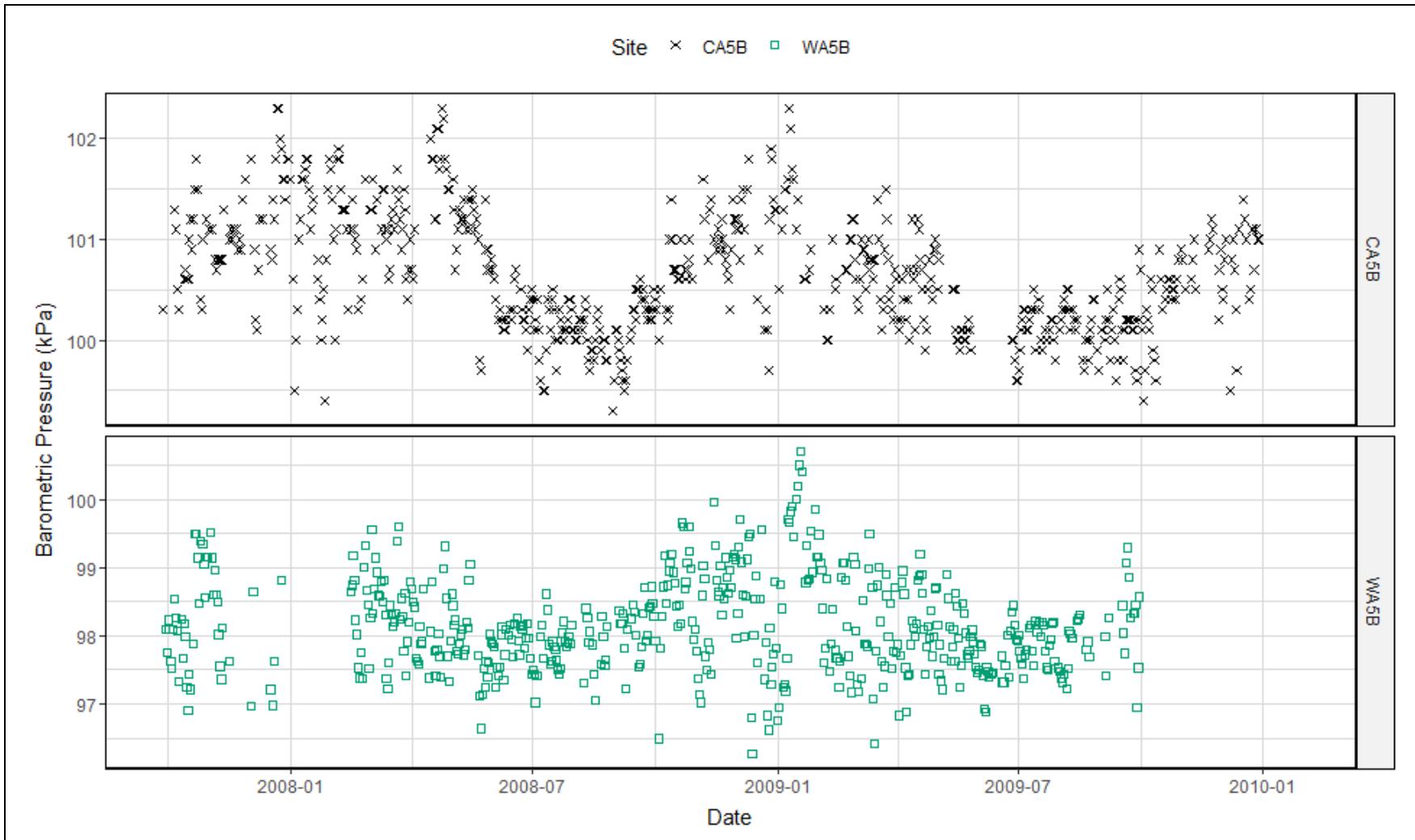


Figure 3.18: Barometric pressure time series for naturally ventilated dairy barns (kPa).

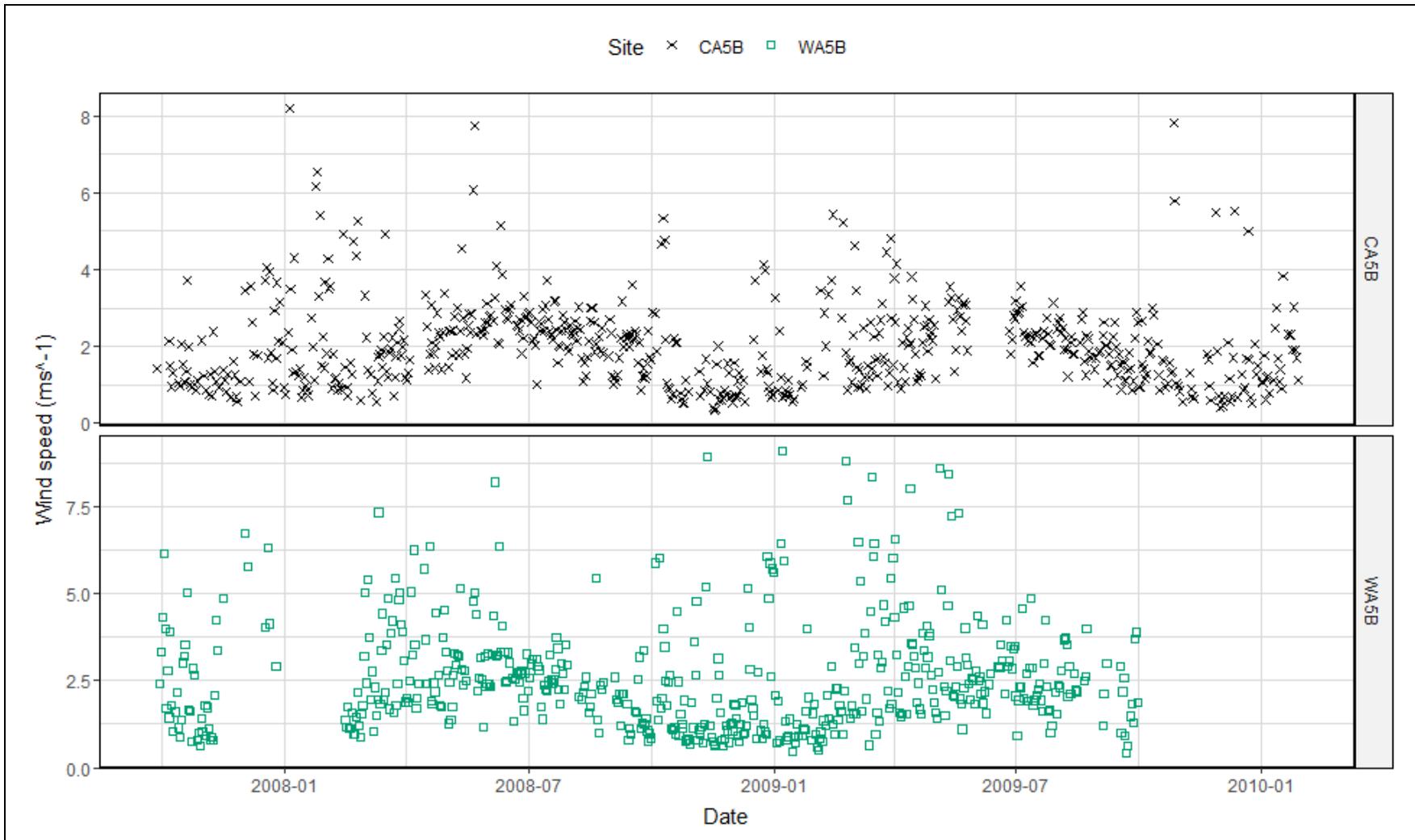


Figure 3.19: Wind Speed time series for naturally ventilated dairy barns (ms⁻¹).

4 Lagoons
4.1 Emissions
4.1.1 Ammonia (NH₃)

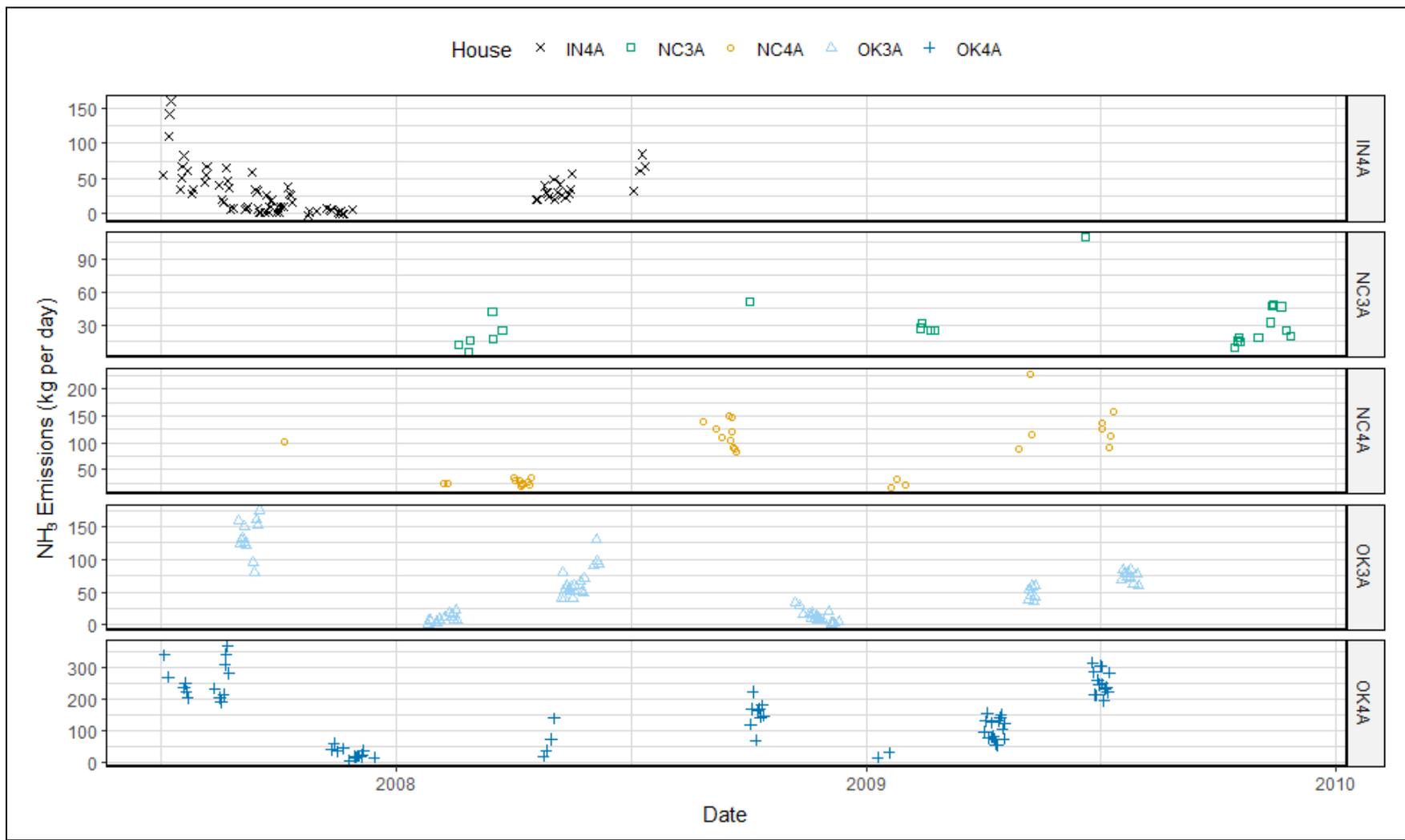


Figure 4.1: NH₃ emission time series for dairy lagoons (kg d⁻¹).

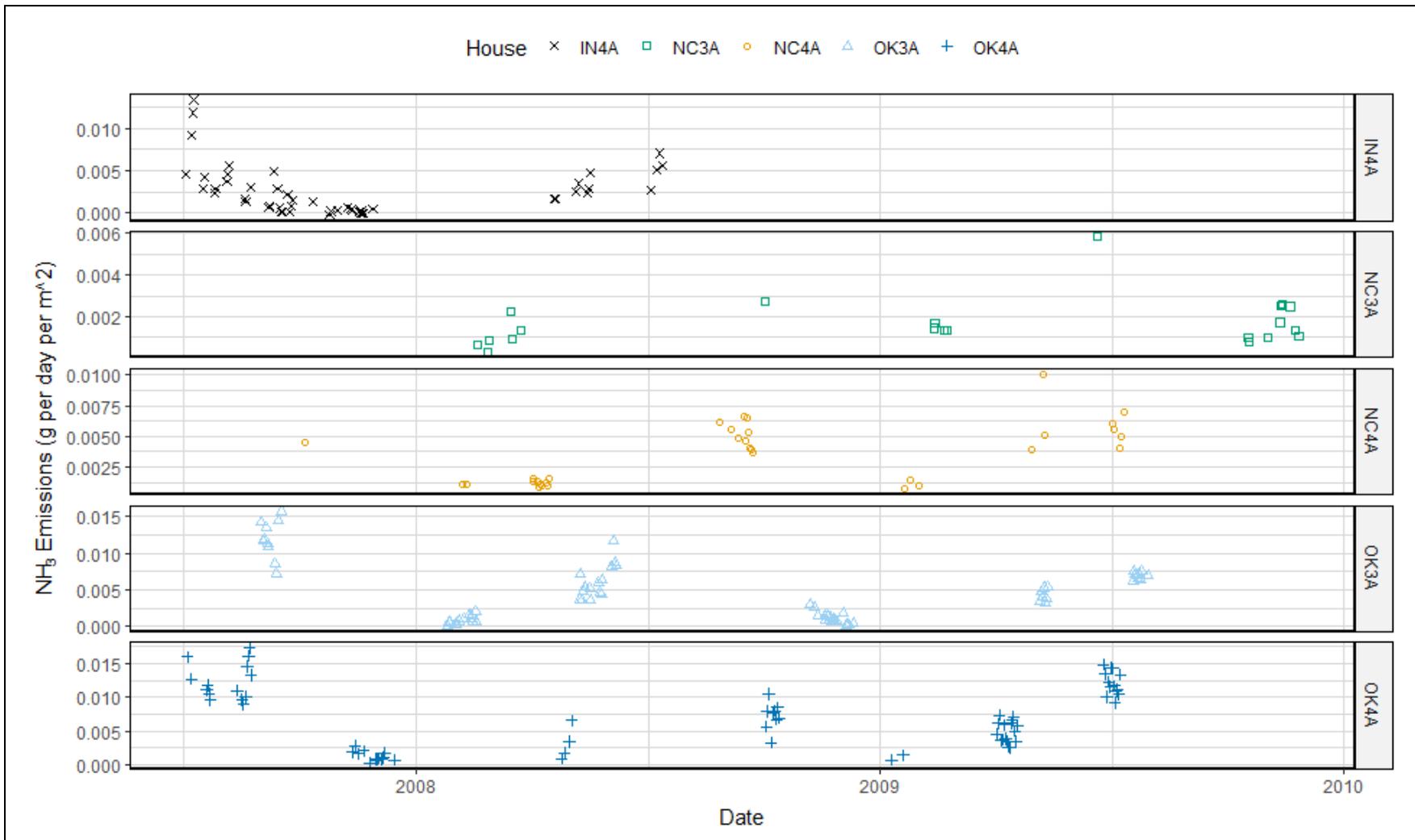


Figure 4.2: NH_3 emission time series for dairy lagoons ($\text{g d}^{-1}\text{m}^{-2}$).

4.1.2 Hydrogen Sulfide (H₂S)

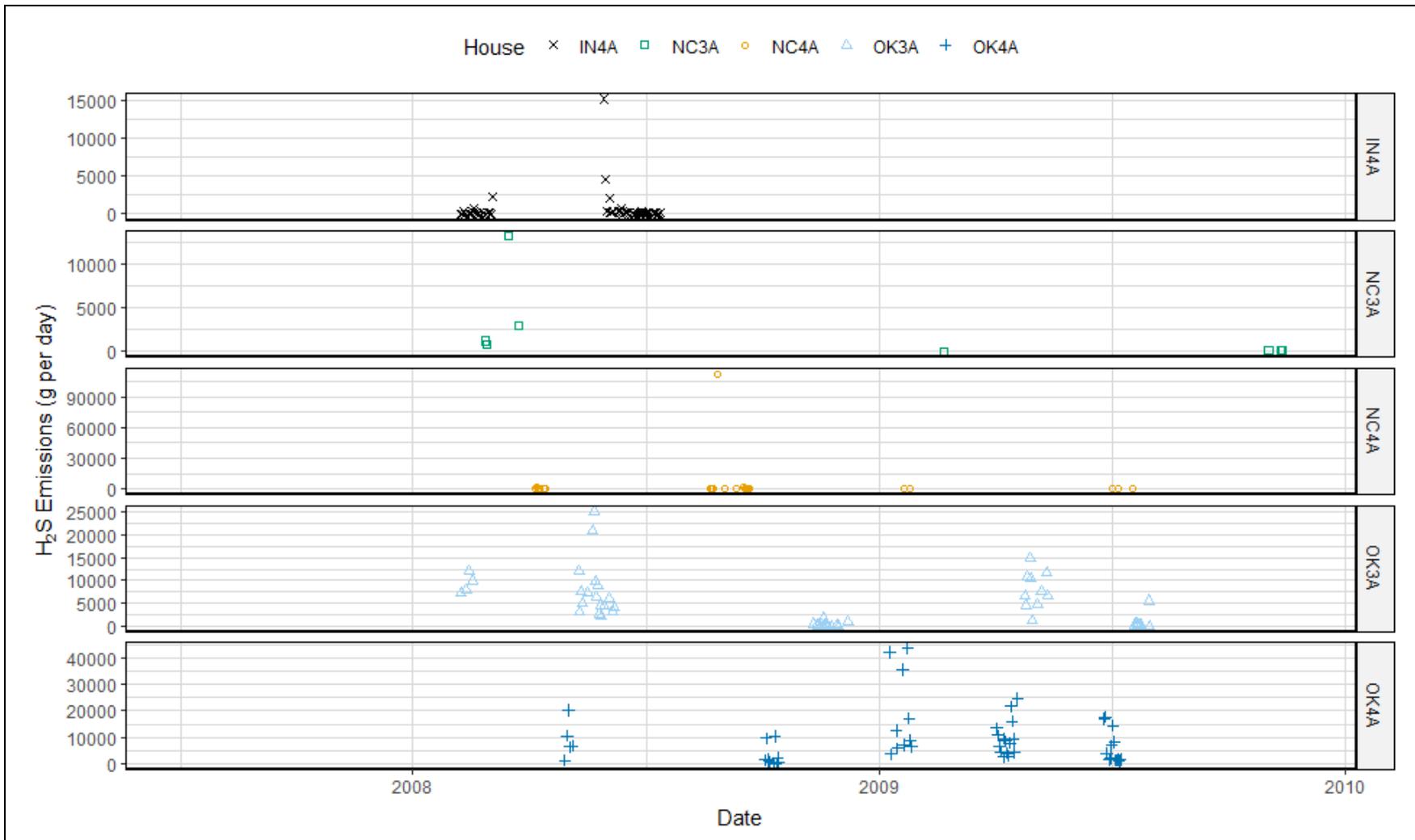


Figure 4.3: H₂S emission time series for dairy lagoons (g d⁻¹).

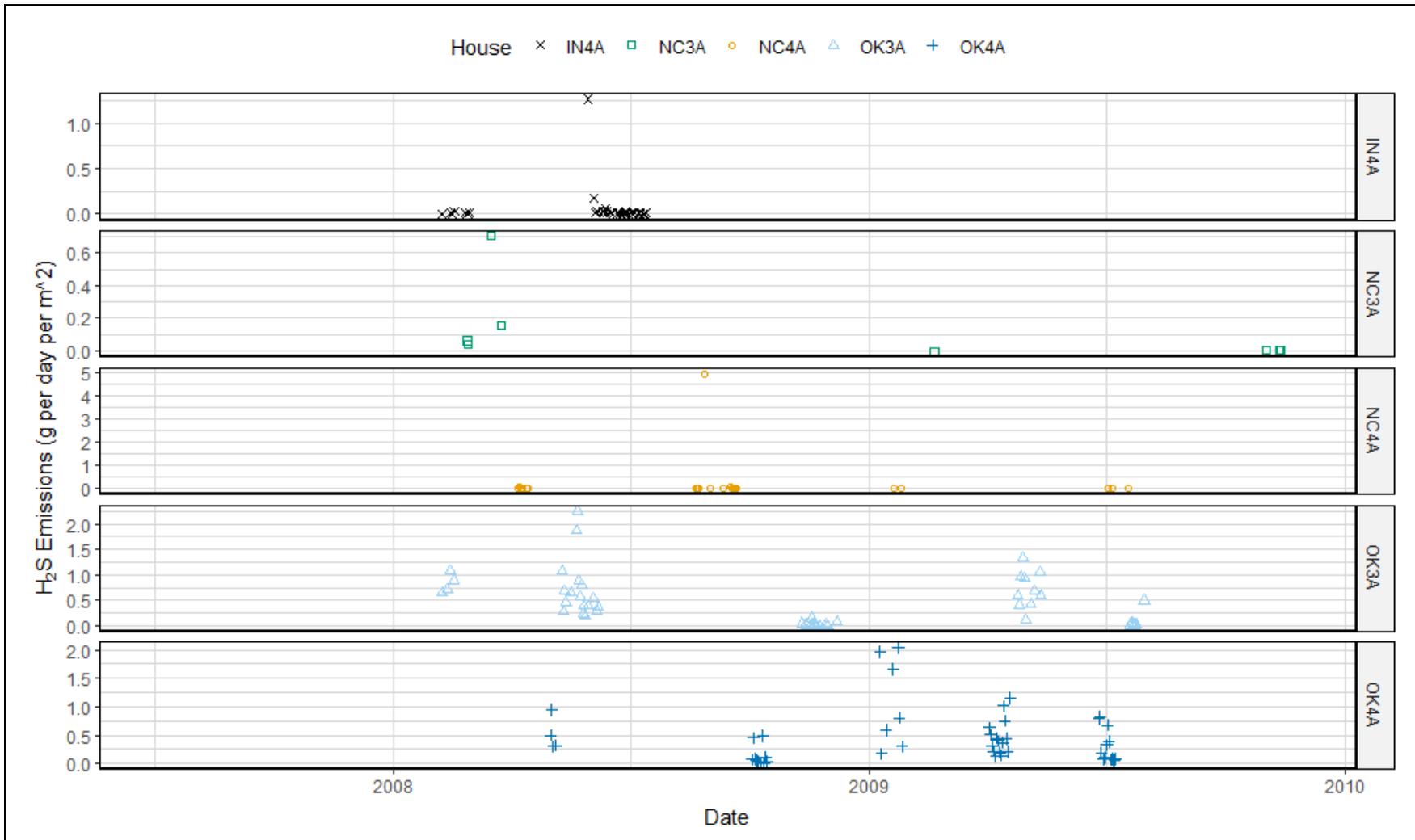


Figure 4.4: H₂S emission time series for dairy lagoons (mg d⁻¹m⁻²).

4.2 Environmental

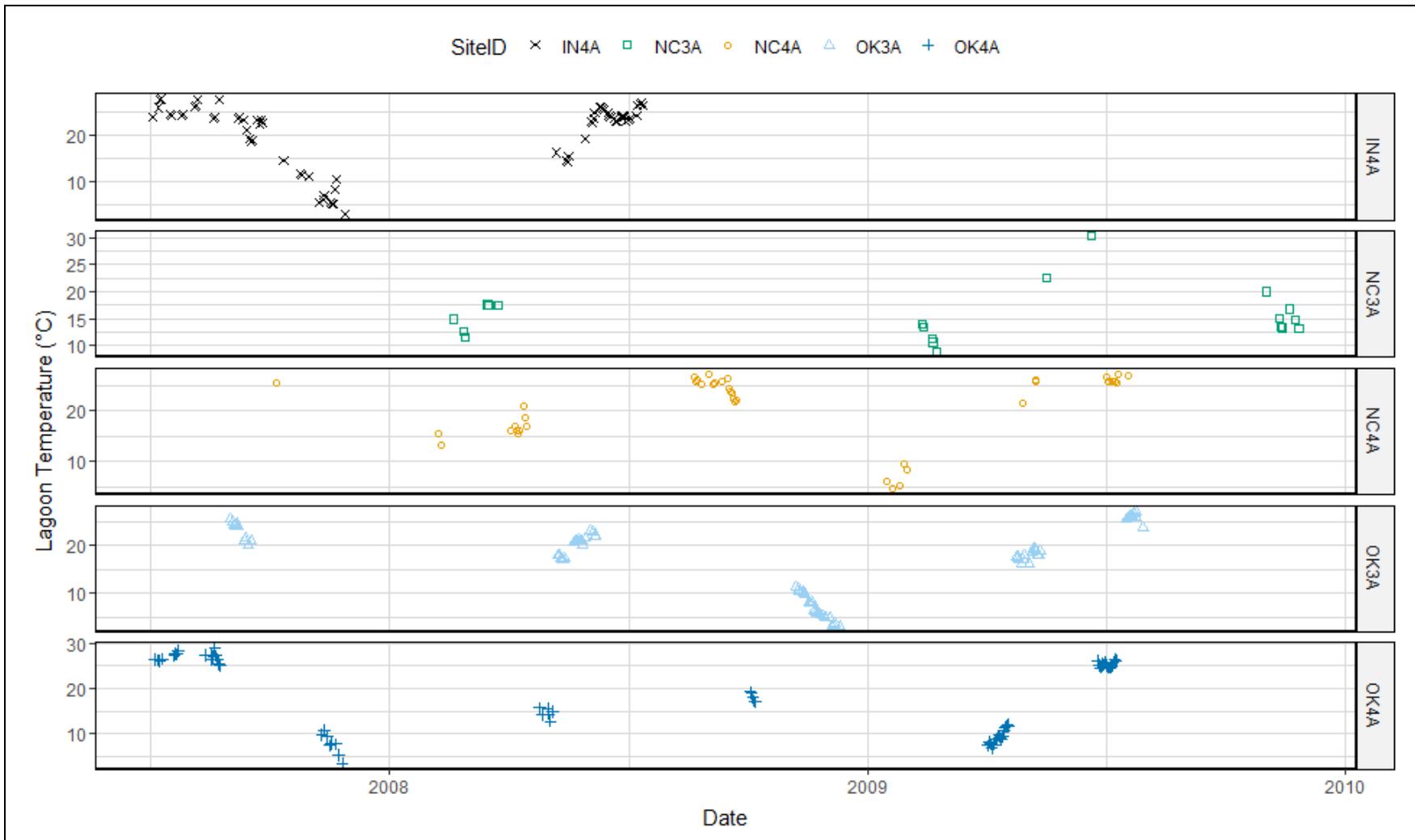


Figure 4.5: Inventory time series for dairy lagoons (hd).

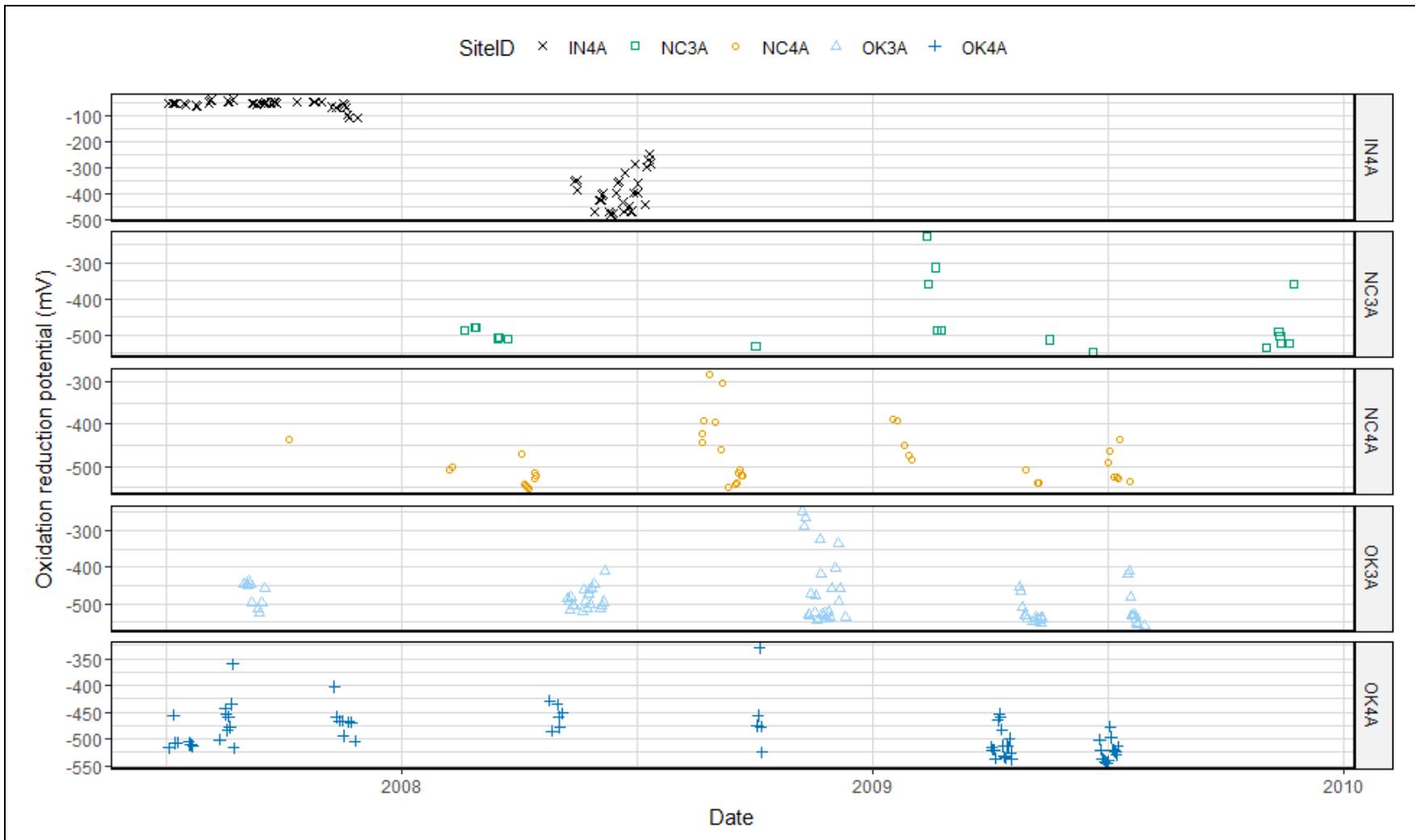


Figure 4.6: Average animal weight emission time series for dairy lagoons (kg).

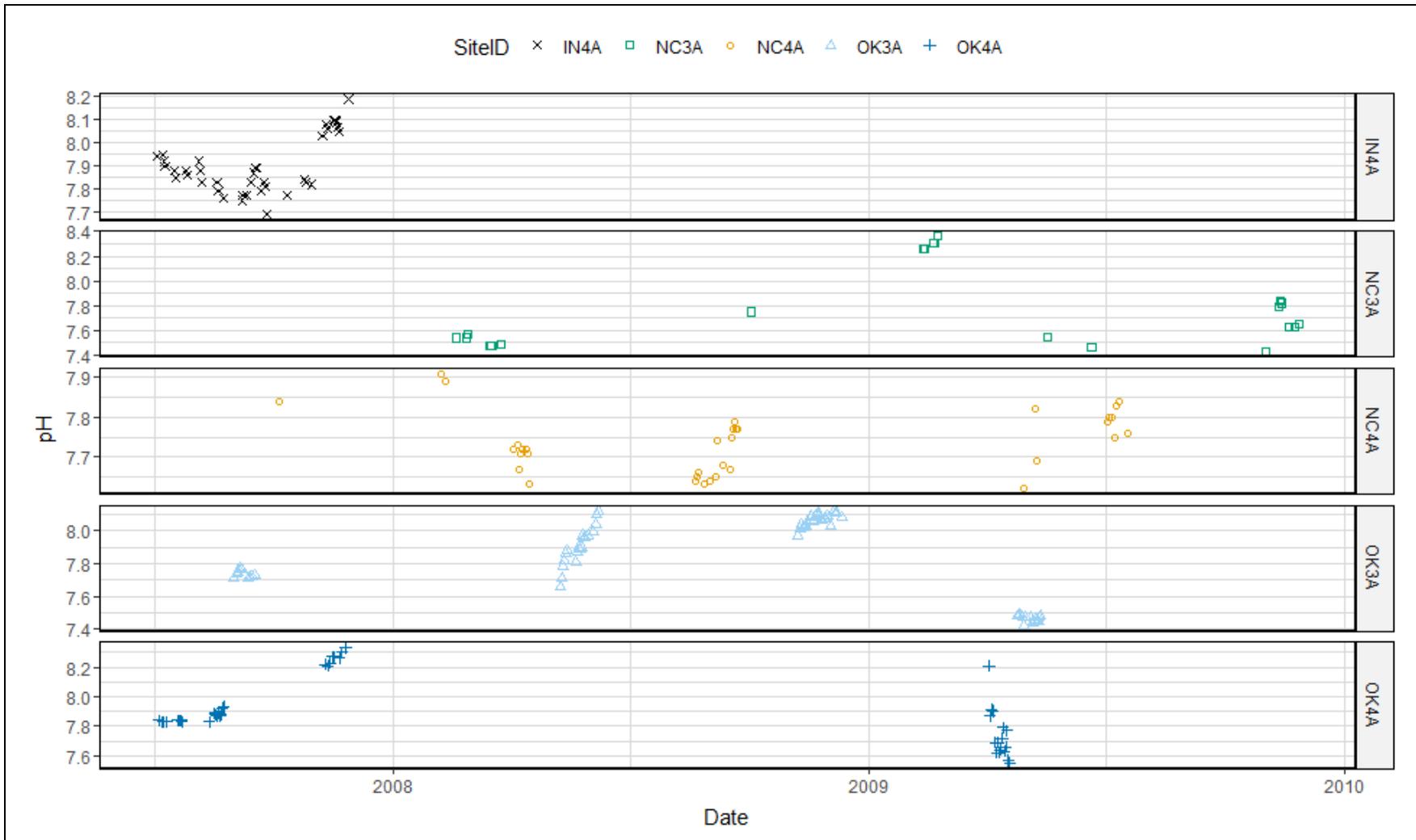


Figure 4.7: Live animal weight time series for dairy lagoons (kg).

4.3 Ambient

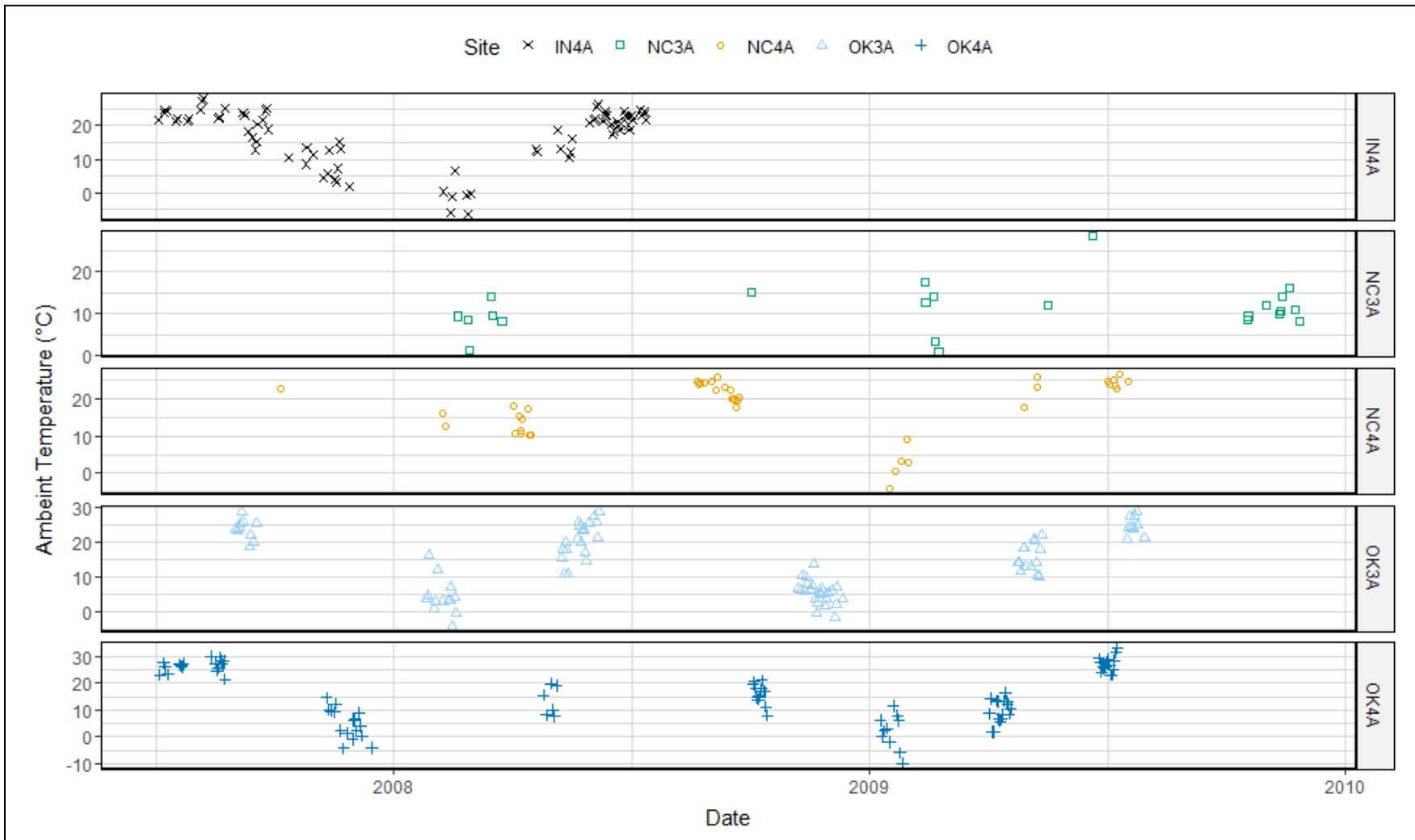


Figure 4.8: Ambient temperature time series for dairy lagoons (°C).

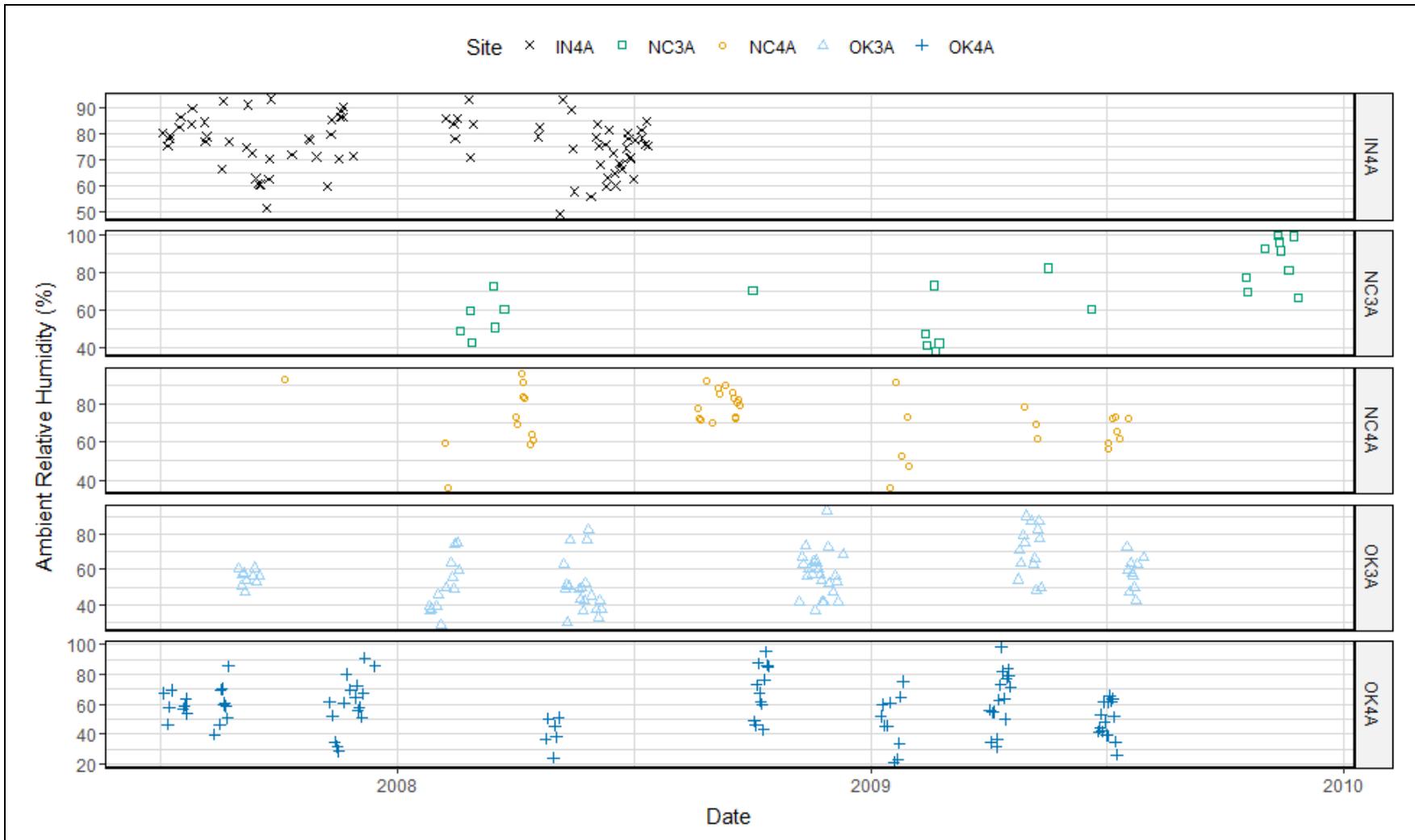


Figure 4.9: Ambient relative humidity time series for dairy lagoons (%).

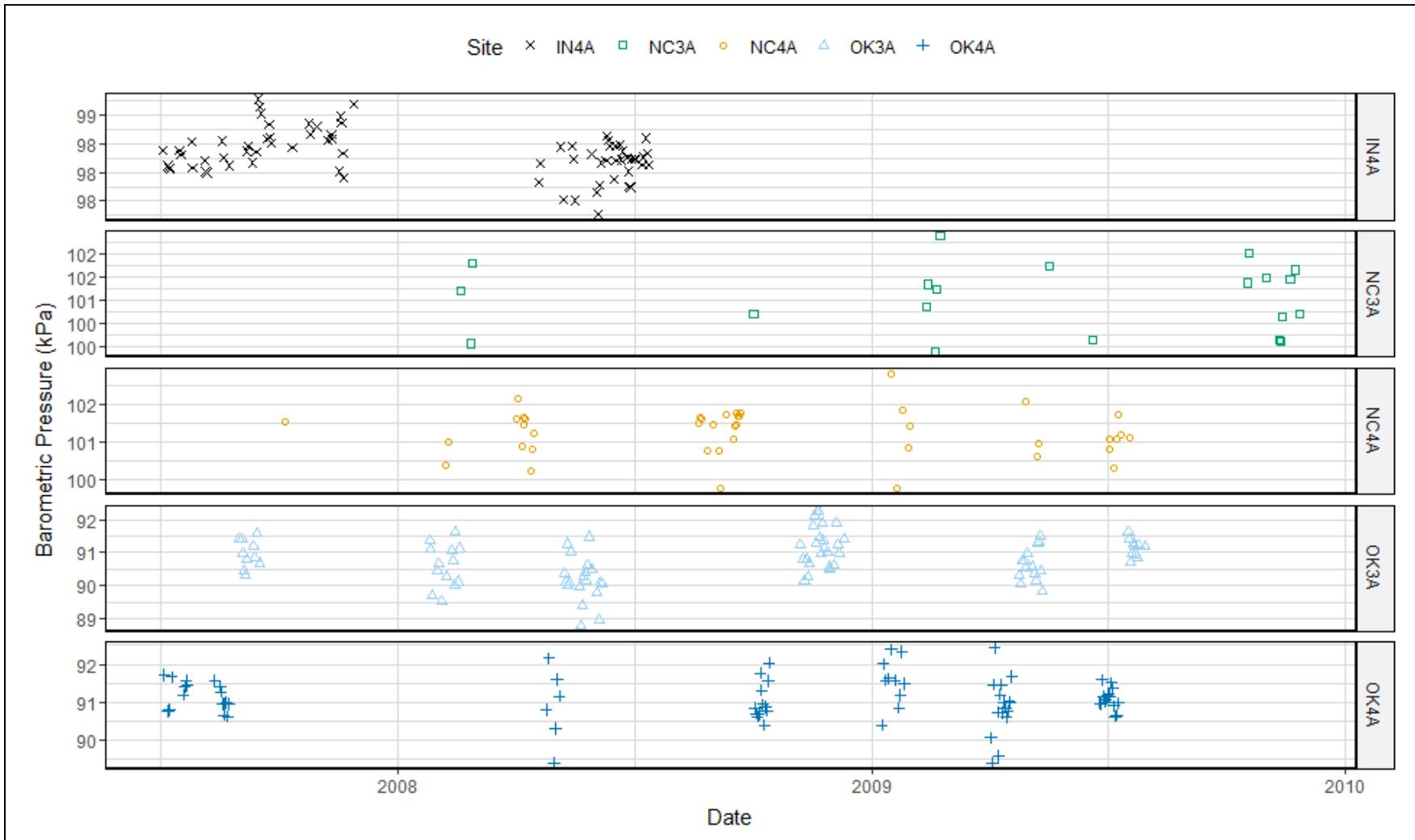


Figure 4.10: Barometric pressure time series for dairy lagoons (kPa).

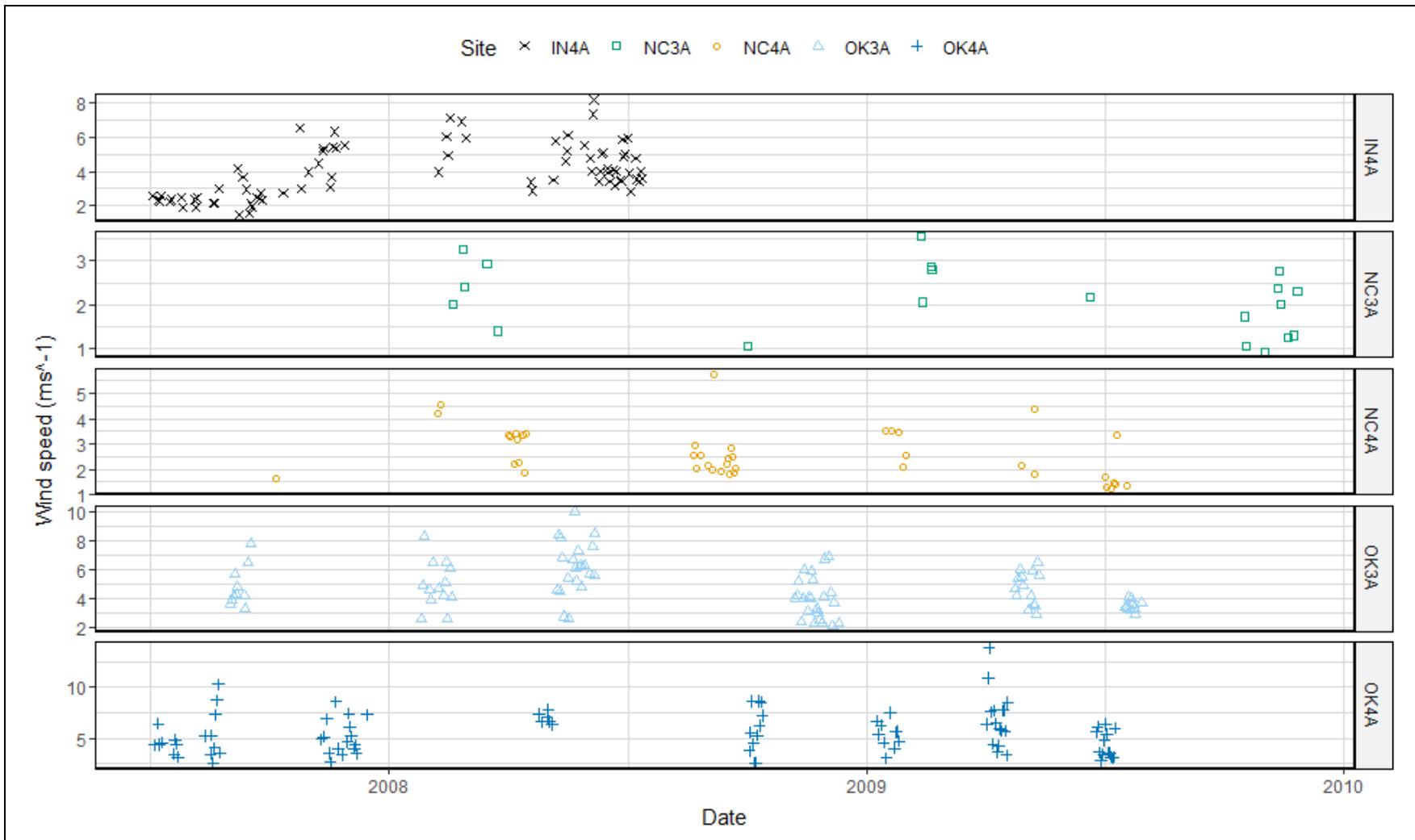


Figure 4.11: Wind Speed time series for dairy lagoons (ms^{-1}).

5 Corral
5.1 Emissions
5.1.1 Ammonia (NH₃)

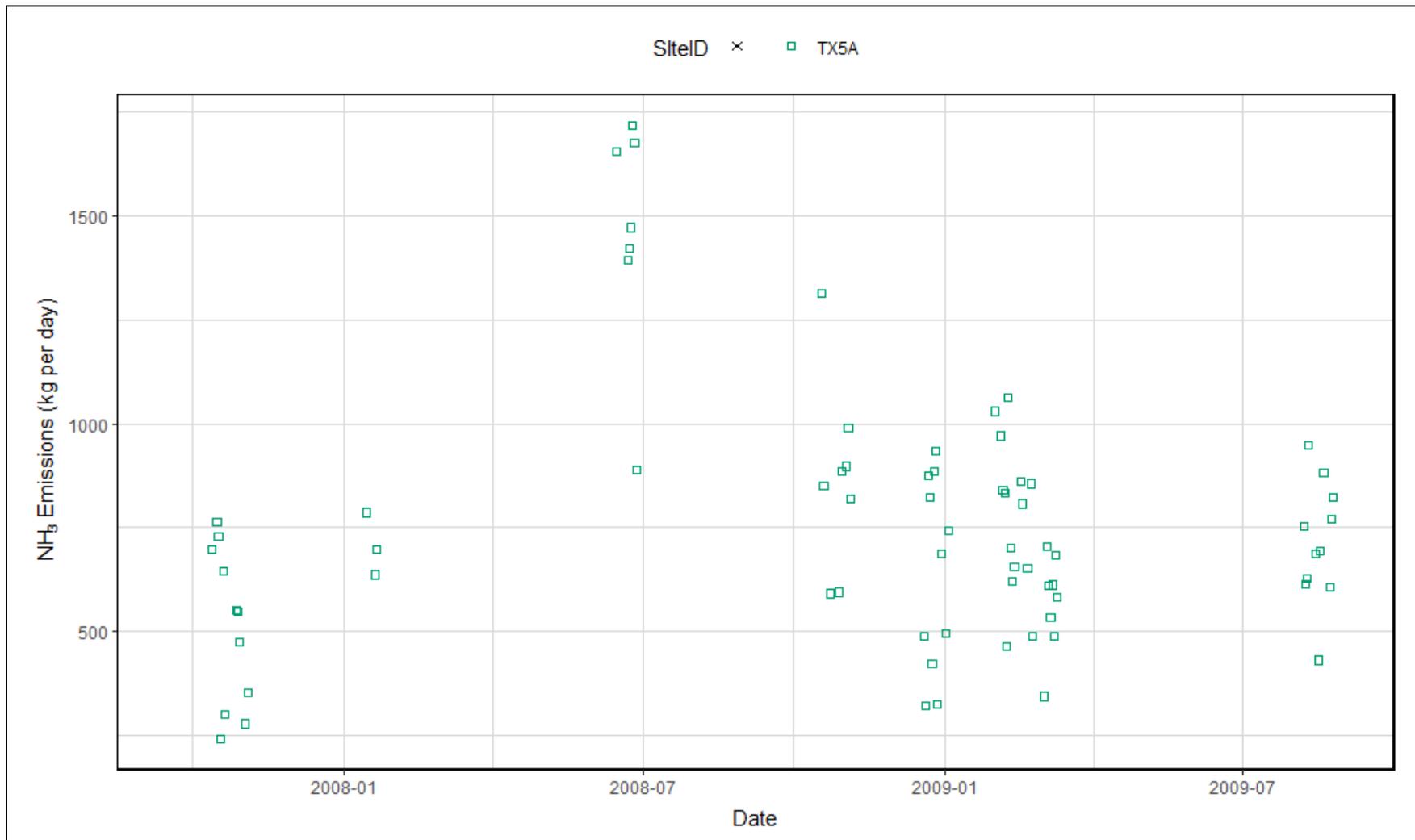


Figure 5.1: NH₃ emission time series for dairy corral (kg d⁻¹).

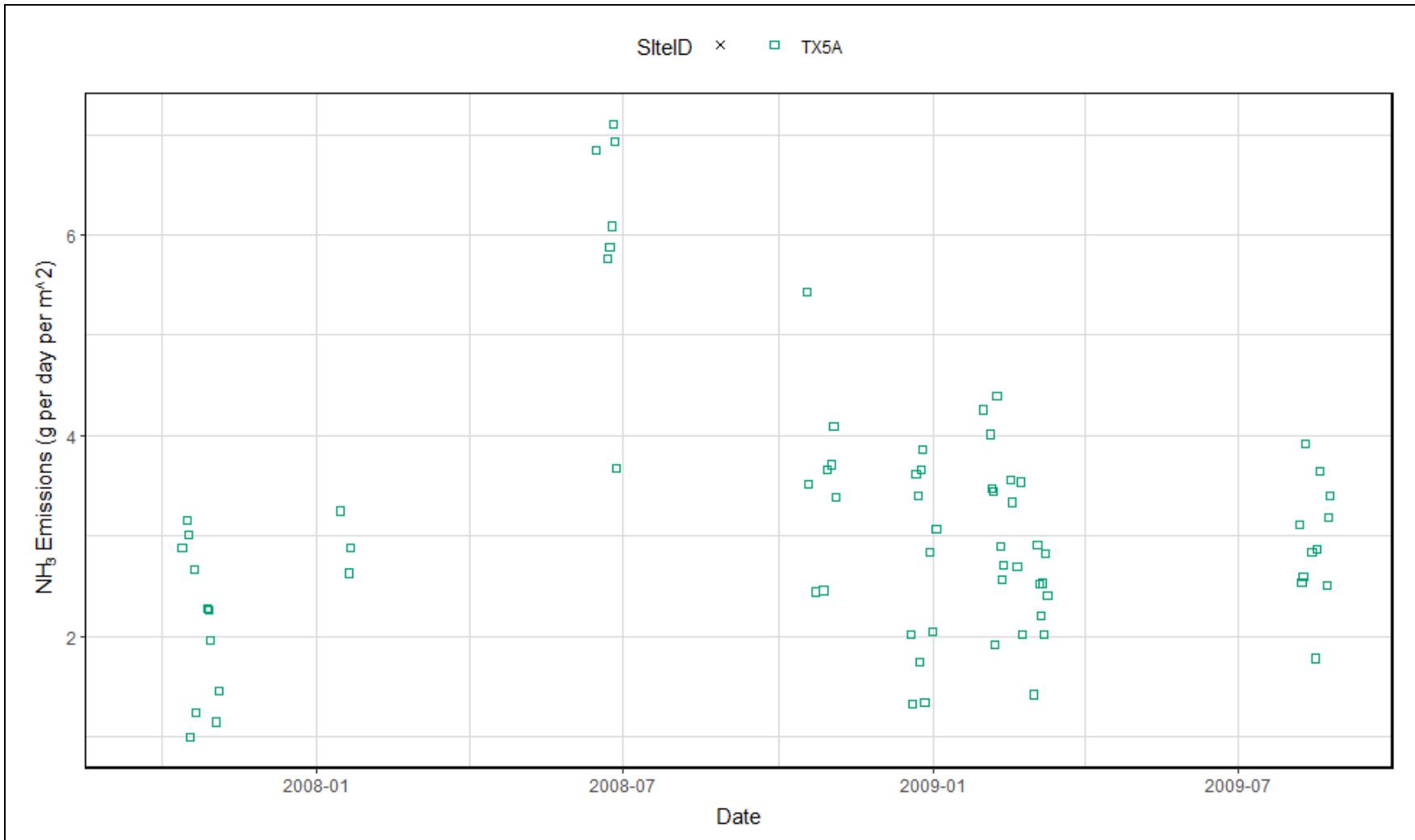


Figure 5.2: NH_3 emission time series for dairy corral ($\text{g d}^{-1}\text{m}^{-2}$).

5.1.2 Hydrogen Sulfide (H₂S)

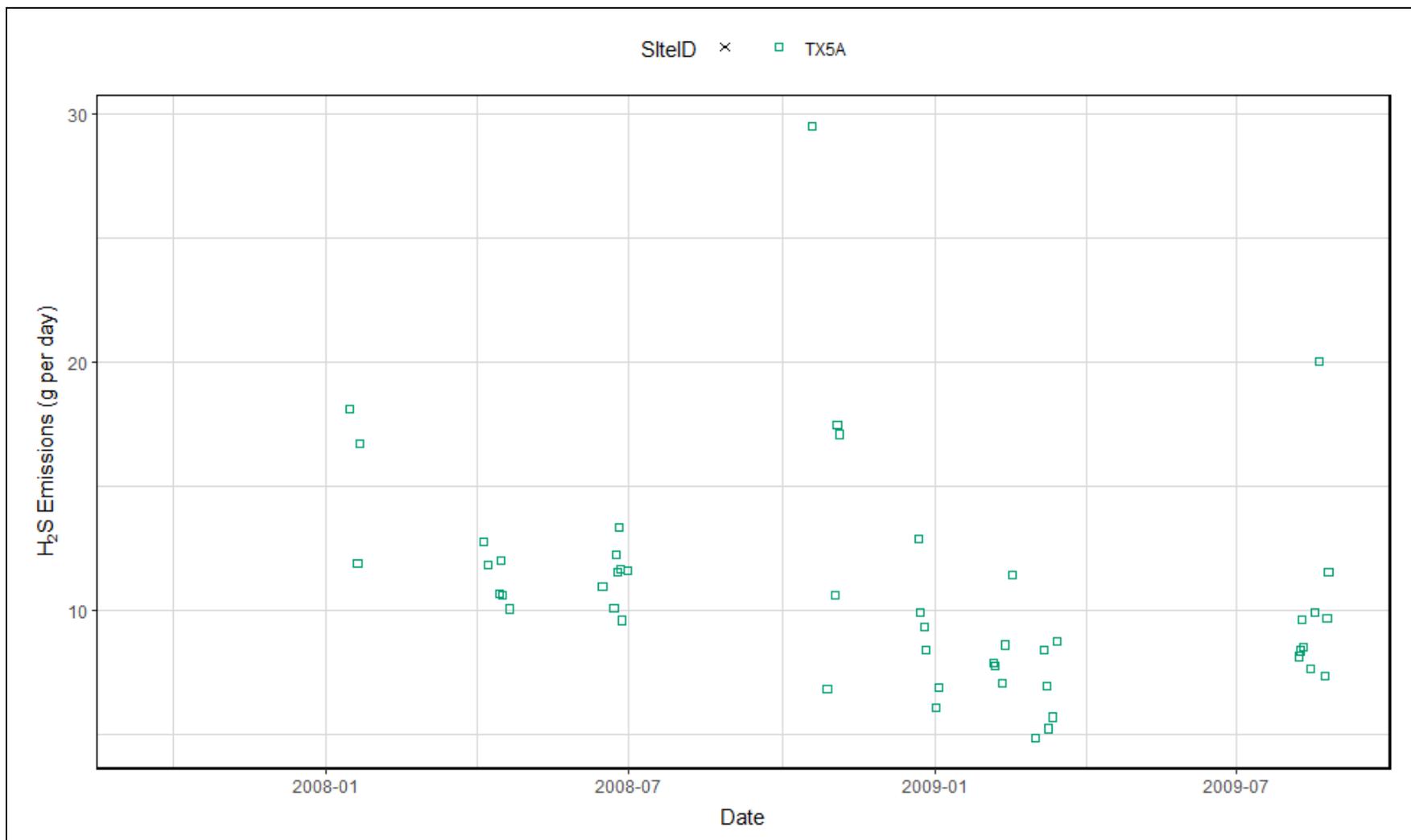


Figure 5.3: H₂S emission time series for dairy corral (g d⁻¹).

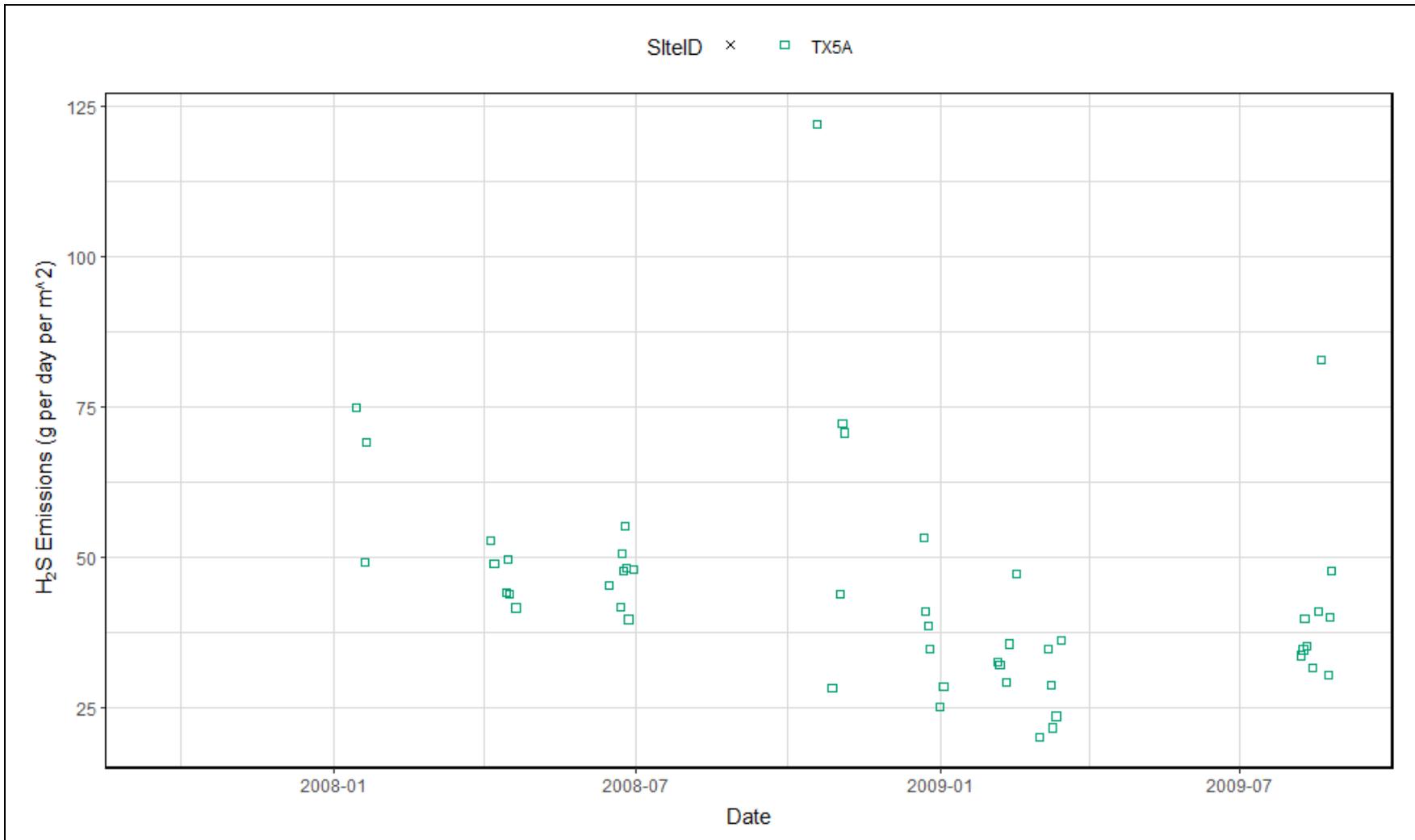


Figure 5.4: H₂S emission time series for dairy corral (mg d⁻¹m⁻²).

5.2 Ambient

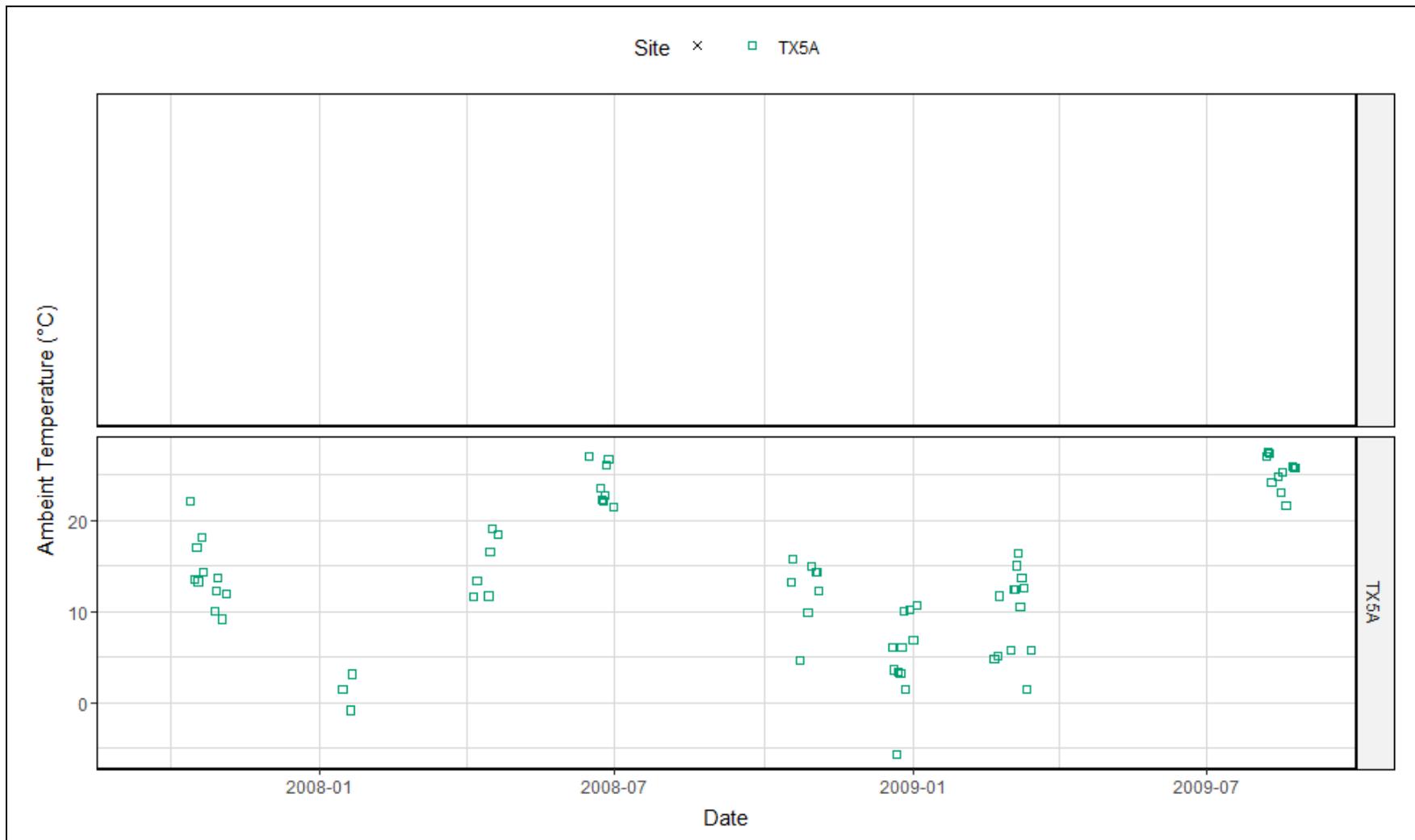


Figure 5.5: Ambient temperature time series for dairy corral (°C).

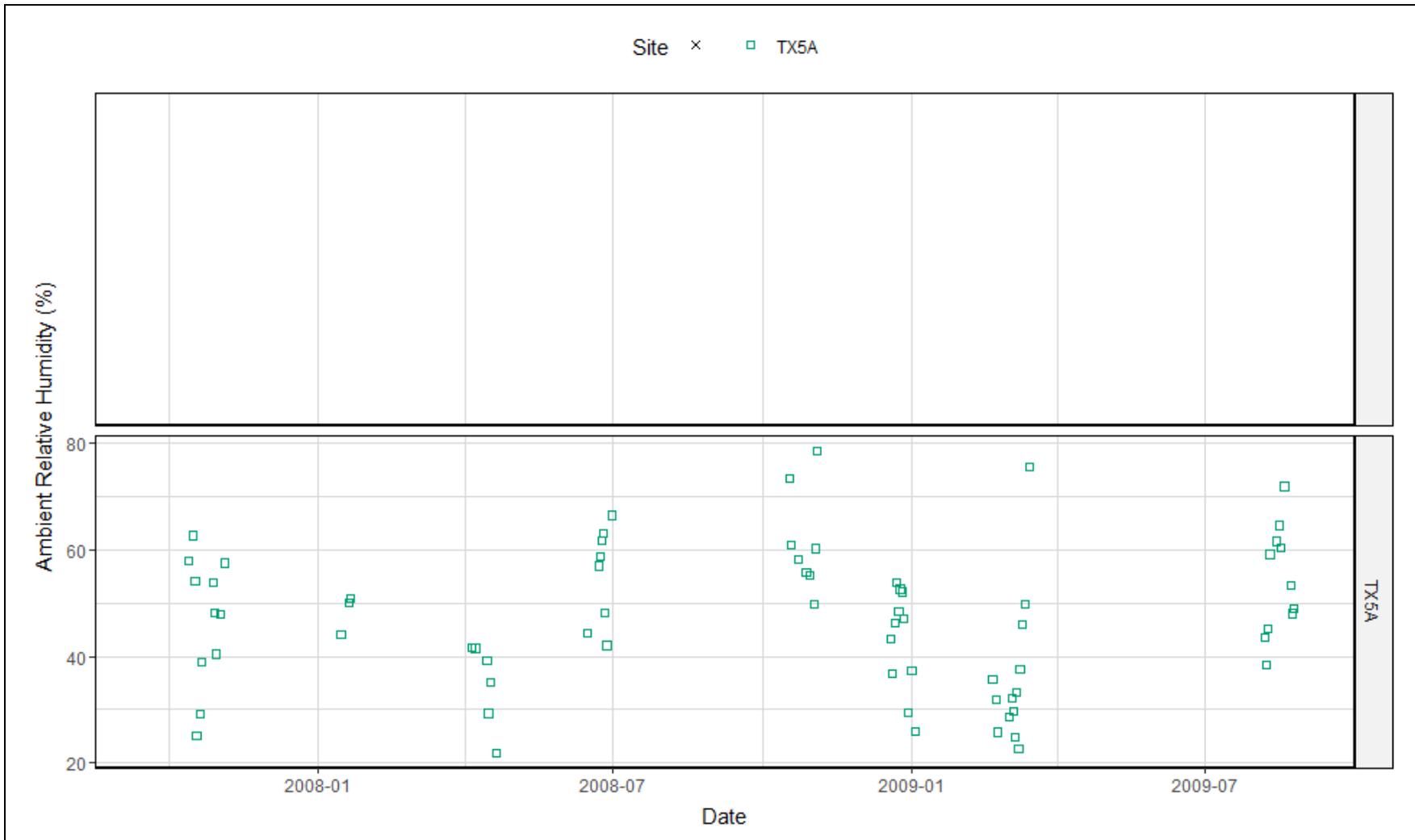


Figure 5.6: Ambient relative humidity time series for dairy corral (%).

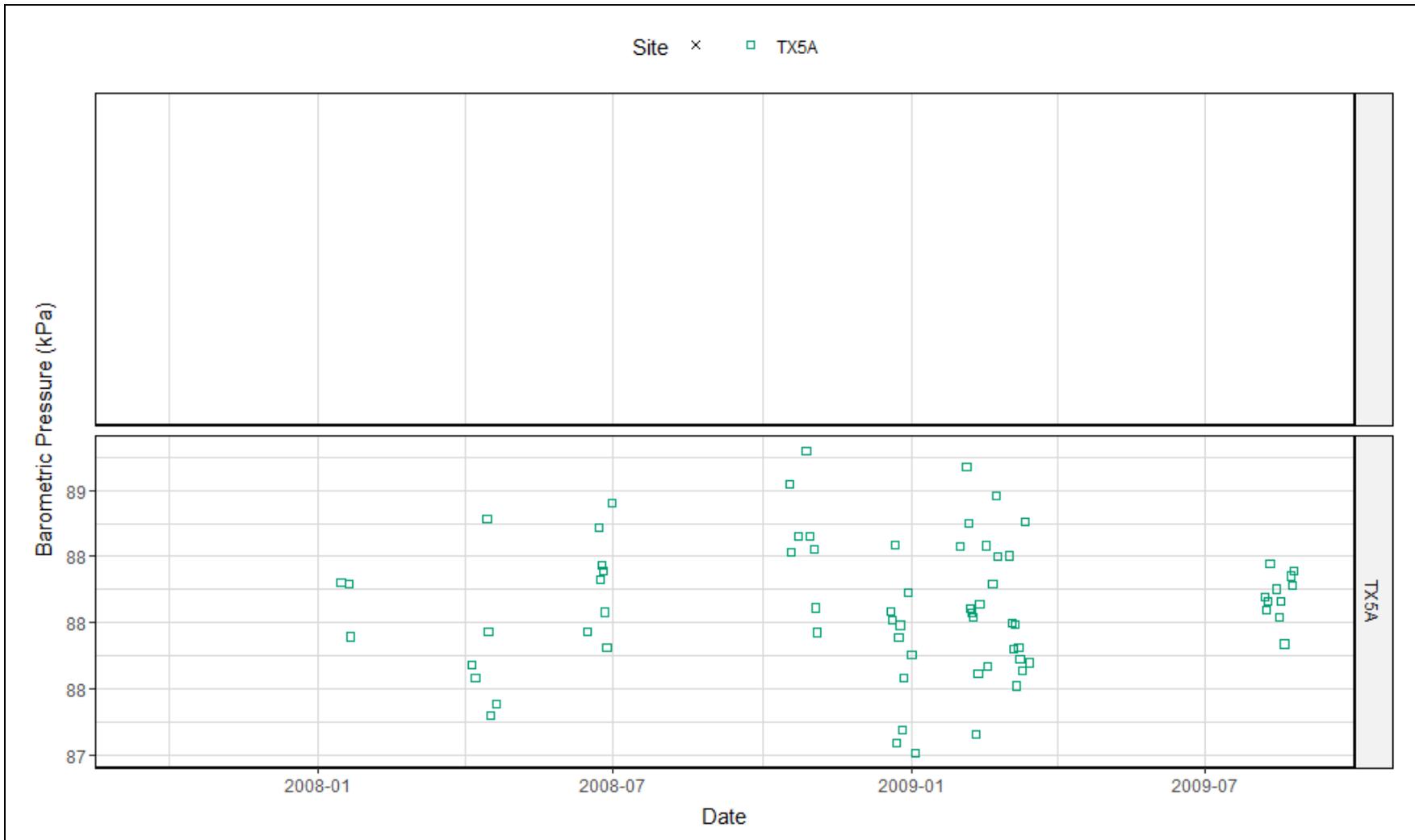
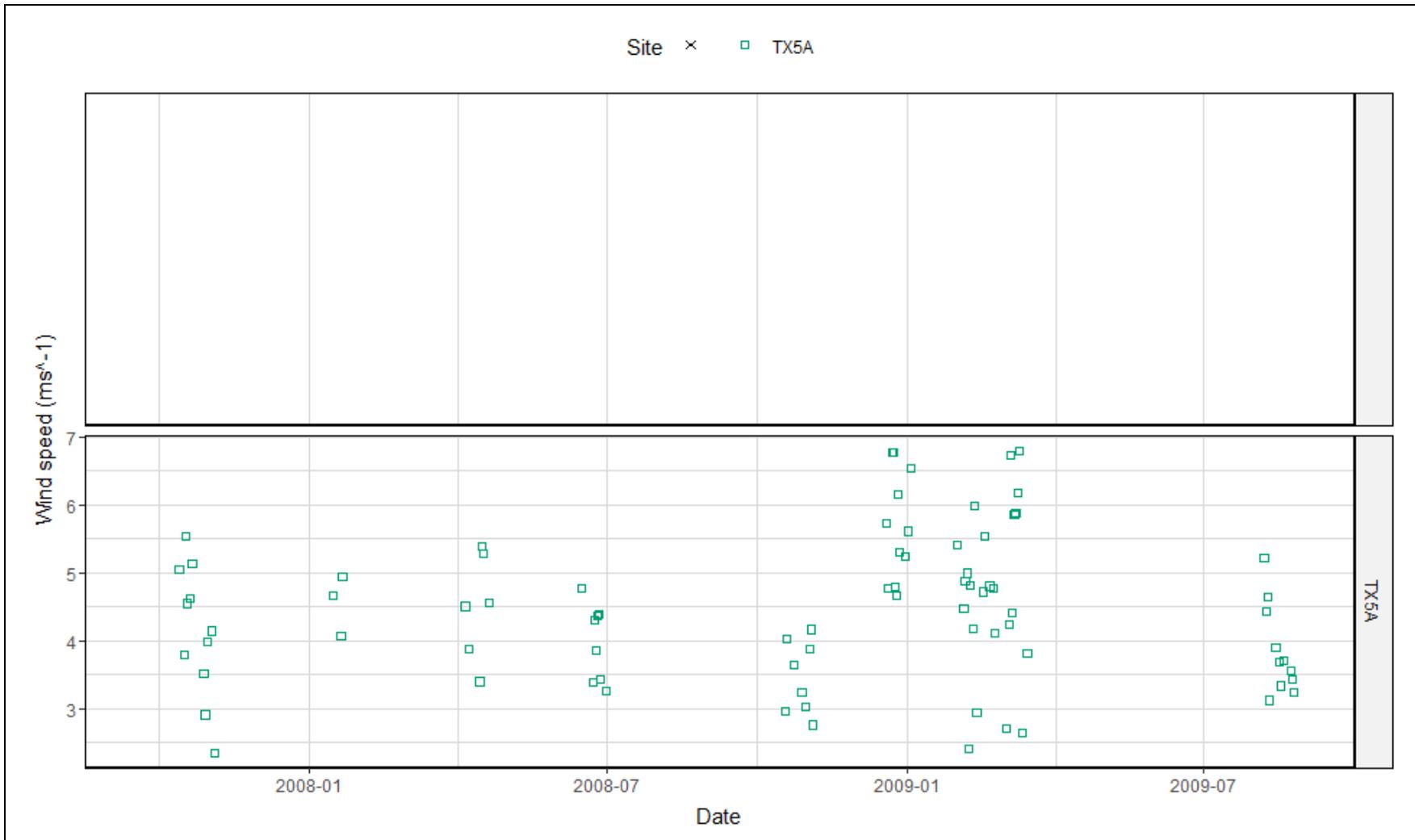


Figure 5.7: Barometric pressure time series for dairy corral (kPa).



Appendix F: Scatter Plots

2024-10-11

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1 Mechanically Ventilated Barns

1.1 Environmental

Table 1.1: Summary of dairy mechanically ventilated barns R² values for environmental parameters (kg d⁻¹)

Emission	Parameter	R	R ²	Strength
NH ₃ (kgd ⁻¹)	Inventory (hd)	0.66	0.44	moderate
H ₂ S (gd ⁻¹)	Inventory (hd)	0.01	0	slight or weak
PM ₁₀ (gd ⁻¹)	Inventory (hd)	-0.22	0.05	slight or weak
PM _{2.5} (gd ⁻¹)	Inventory (hd)	-0.19	0.03	slight or weak
TSP (gd ⁻¹)	Inventory (hd)	-0.35	0.12	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Inventory (hd)	0.18	0.03	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	-0.34	0.11	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	-0.34	0.12	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	-0.4	0.16	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	-0.53	0.28	modest
NH ₃ (kgd ⁻¹)	Average weight (kg)	-0.42	0.18	slight or weak
H ₂ S (gd ⁻¹)	Average weight (kg)	0.11	0.01	slight or weak
PM ₁₀ (gd ⁻¹)	Average weight (kg)	0.22	0.05	slight or weak
PM _{2.5} (gd ⁻¹)	Average weight (kg)	0.39	0.15	slight or weak
TSP (gd ⁻¹)	Average weight (kg)	0.39	0.15	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Average weight (kg)	-0.2	0.04	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	0.32	0.1	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	0.31	0.1	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	0.47	0.22	modest
TSP (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	0.48	0.23	modest
NH ₃ (kgd ⁻¹)	Live animal weight (kg)	0.65	0.43	moderate
H ₂ S (gd ⁻¹)	Live animal weight (kg)	0.02	0	slight or weak
PM ₁₀ (gd ⁻¹)	Live animal weight (kg)	-0.2	0.04	slight or weak
PM _{2.5} (gd ⁻¹)	Live animal weight (kg)	-0.14	0.02	slight or weak
TSP (gd ⁻¹)	Live animal weight (kg)	-0.33	0.11	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0.17	0.03	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	-0.32	0.11	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	-0.32	0.11	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	-0.36	0.13	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	-0.51	0.26	modest
NH ₃ (kgd ⁻¹)	Exhaust Temperature (°C)	0.49	0.24	modest
H ₂ S (gd ⁻¹)	Exhaust Temperature (°C)	0.32	0.11	slight or weak
PM ₁₀ (gd ⁻¹)	Exhaust Temperature (°C)	0.5	0.25	modest
PM _{2.5} (gd ⁻¹)	Exhaust Temperature (°C)	0.47	0.22	modest
TSP (gd ⁻¹)	Exhaust Temperature (°C)	0.42	0.18	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.73	0.53	moderate
H ₂ S (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.13	0.02	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.46	0.21	modest
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.39	0.16	slight or weak

Emission	Parameter	R	R ²	Strength
TSP (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.42	0.18	slight or weak
NH ₃ (kgd ⁻¹)	Exhaust Relative humidity (%)	0.39	0.15	slight or weak
H ₂ S (gd ⁻¹)	Exhaust Relative humidity (%)	0.19	0.04	slight or weak
PM ₁₀ (gd ⁻¹)	Exhaust Relative humidity (%)	-0.24	0.06	slight or weak
PM _{2.5} (gd ⁻¹)	Exhaust Relative humidity (%)	-0.42	0.18	slight or weak
TSP (gd ⁻¹)	Exhaust Relative humidity (%)	-0.34	0.12	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	0.26	0.07	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.05	0	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.23	0.05	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.49	0.24	modest
TSP (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.32	0.1	slight or weak
NH ₃ (kgd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.54	0.29	modest
H ₂ S (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.23	0.05	slight or weak
PM ₁₀ (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.53	0.28	modest
PM _{2.5} (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.53	0.28	modest
TSP (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.39	0.15	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.61	0.37	modest
H ₂ S (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.01	0	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.46	0.21	modest
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.42	0.17	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.3	0.09	slight or weak

1.1.1 Ammonia (NH₃)

1.1.1.1 Inventory

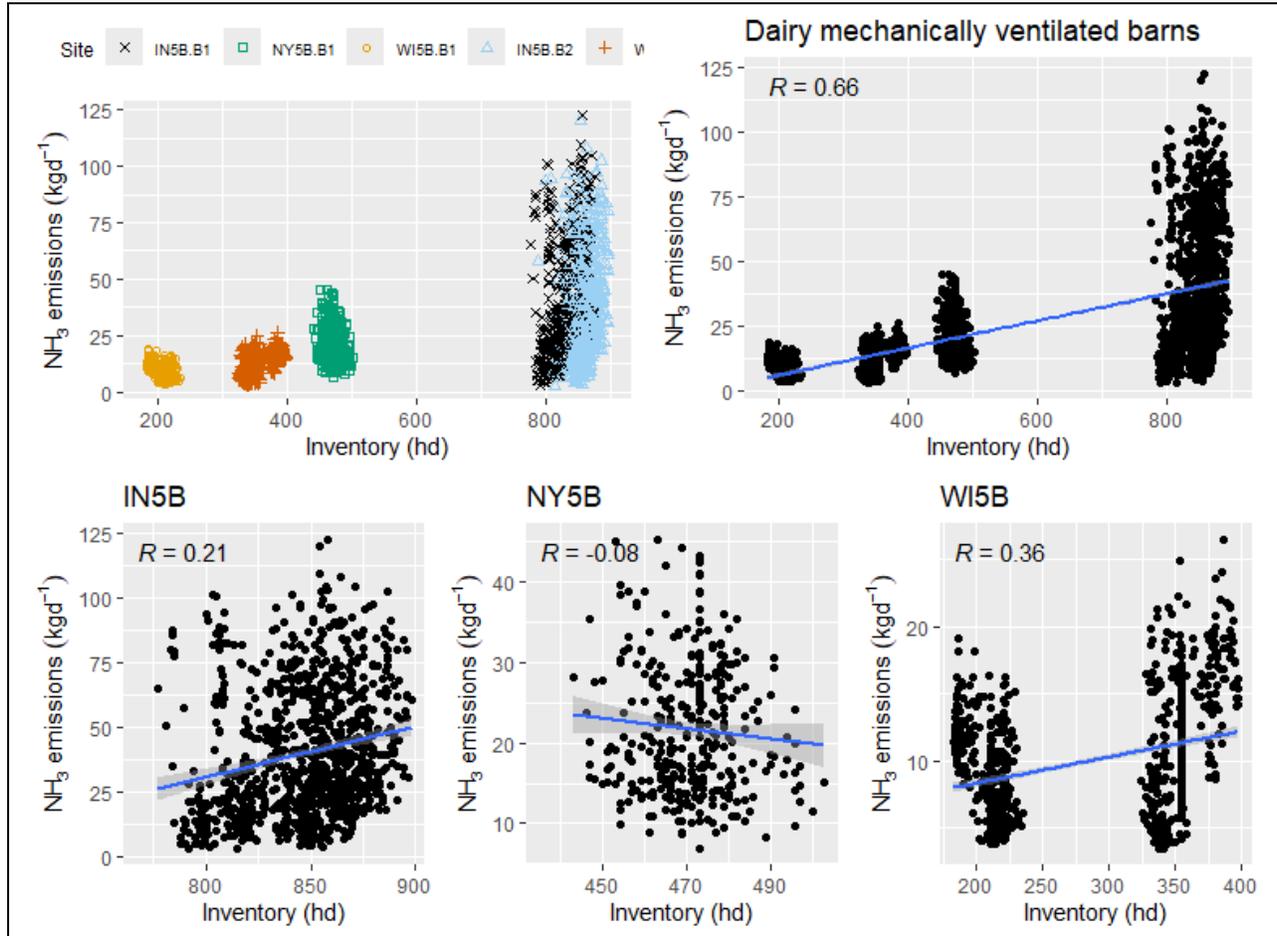


Figure 1.1: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus Inventory.

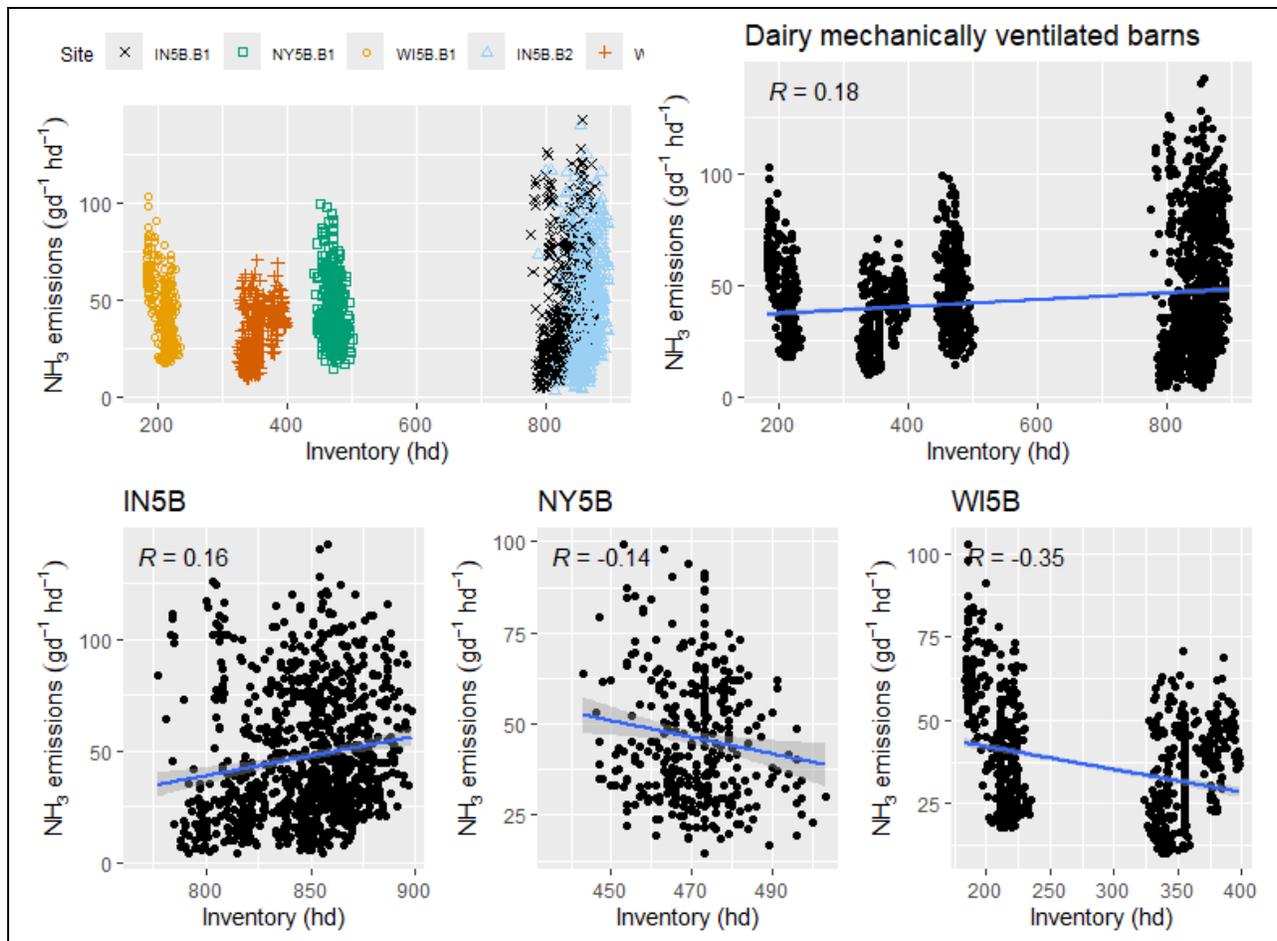


Figure 1.2: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus Inventory.

1.1.1.2 Average animal weight

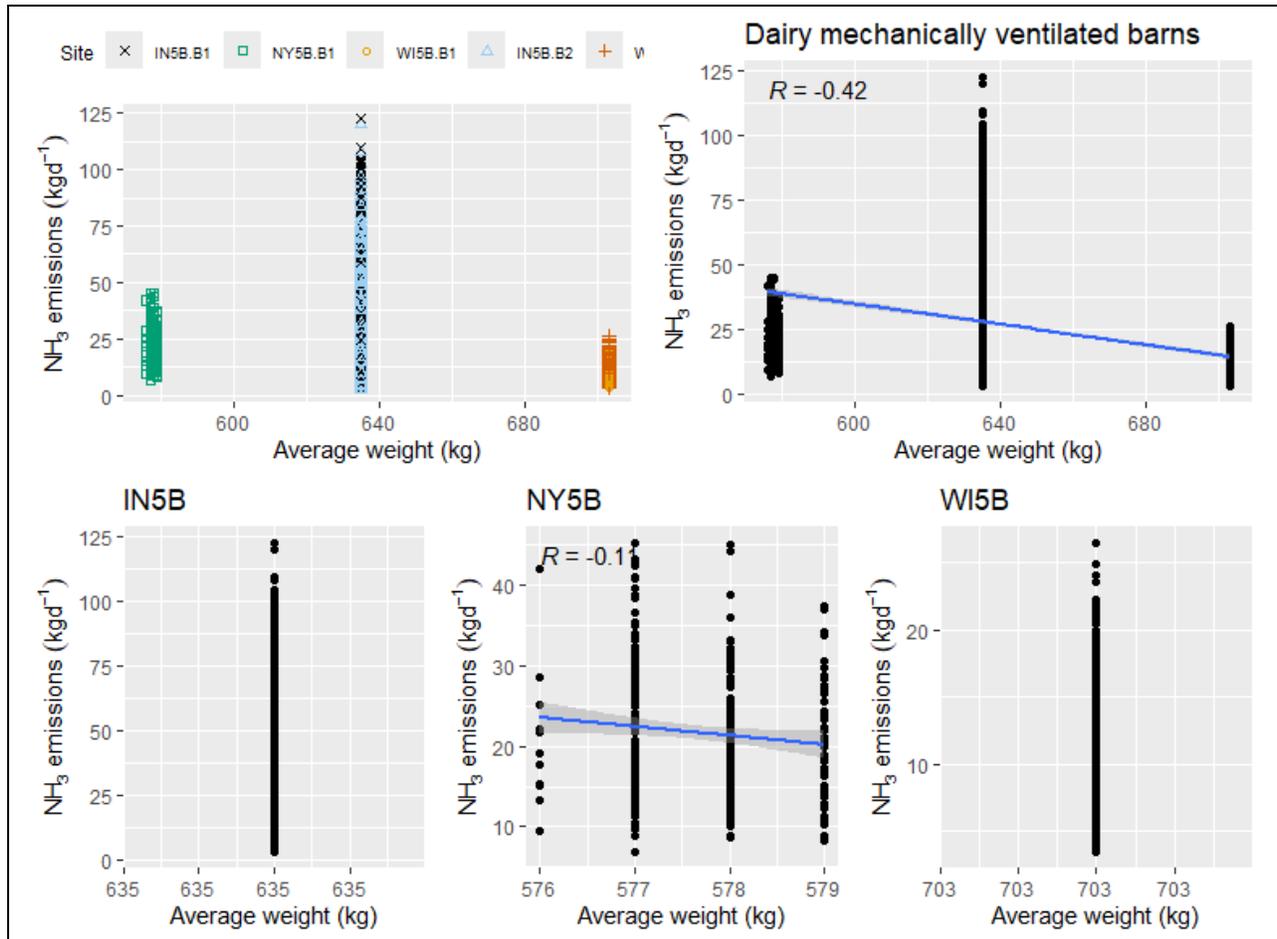


Figure 1.3: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus average animal weight.

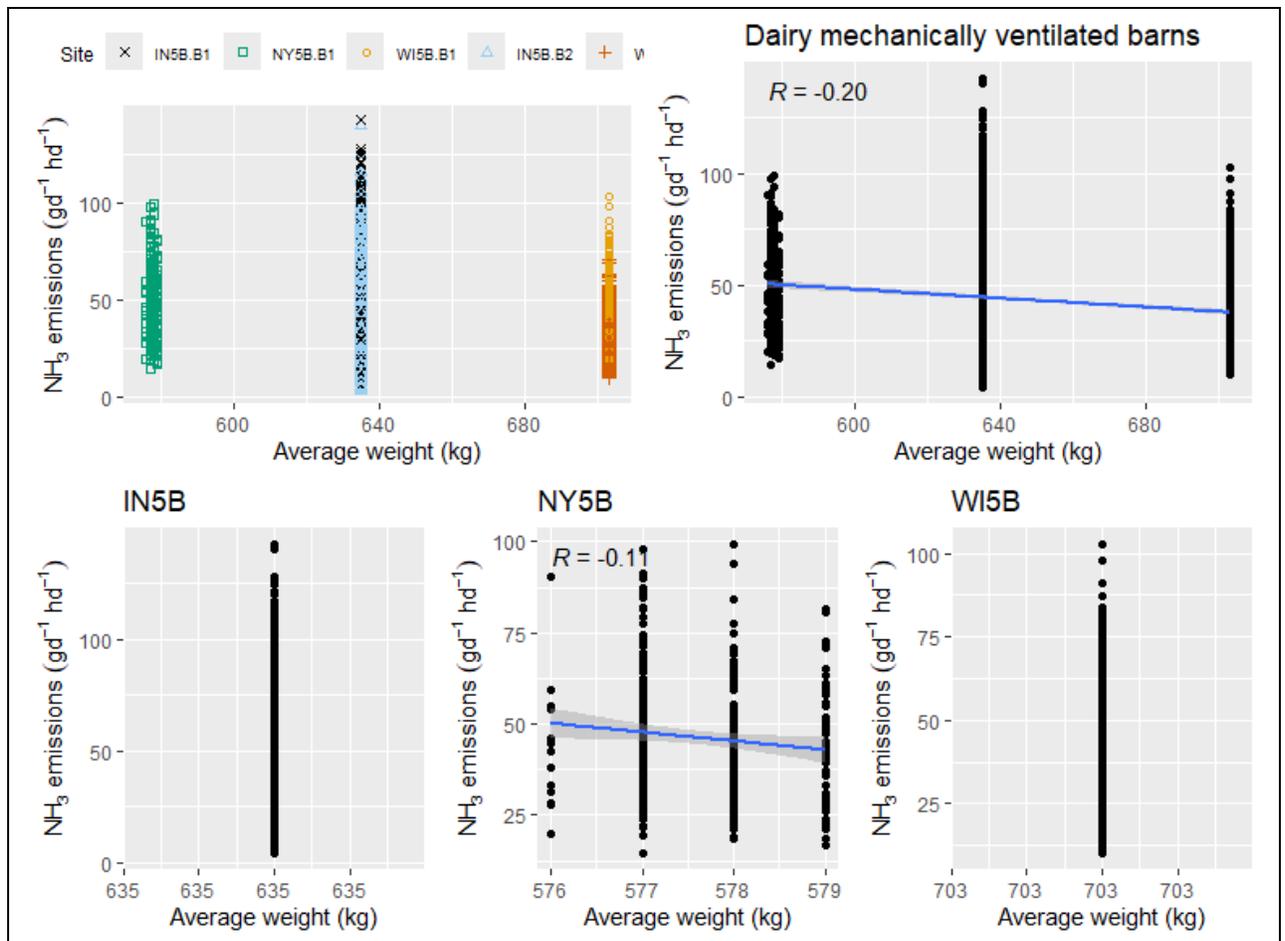


Figure 1.4: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus average animal weight.

1.1.1.3 Live animal weight

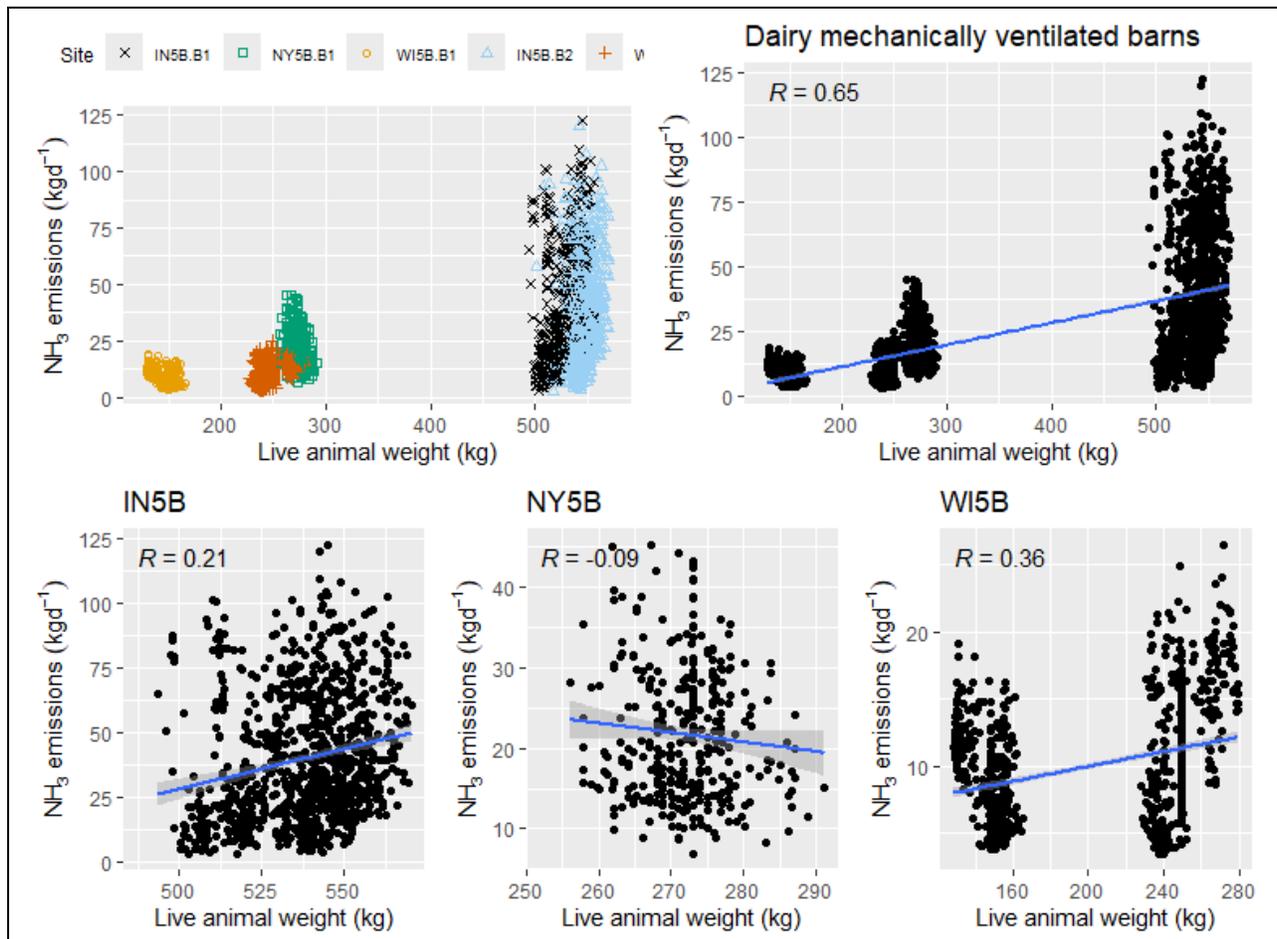


Figure 1.5: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus live animal weight.

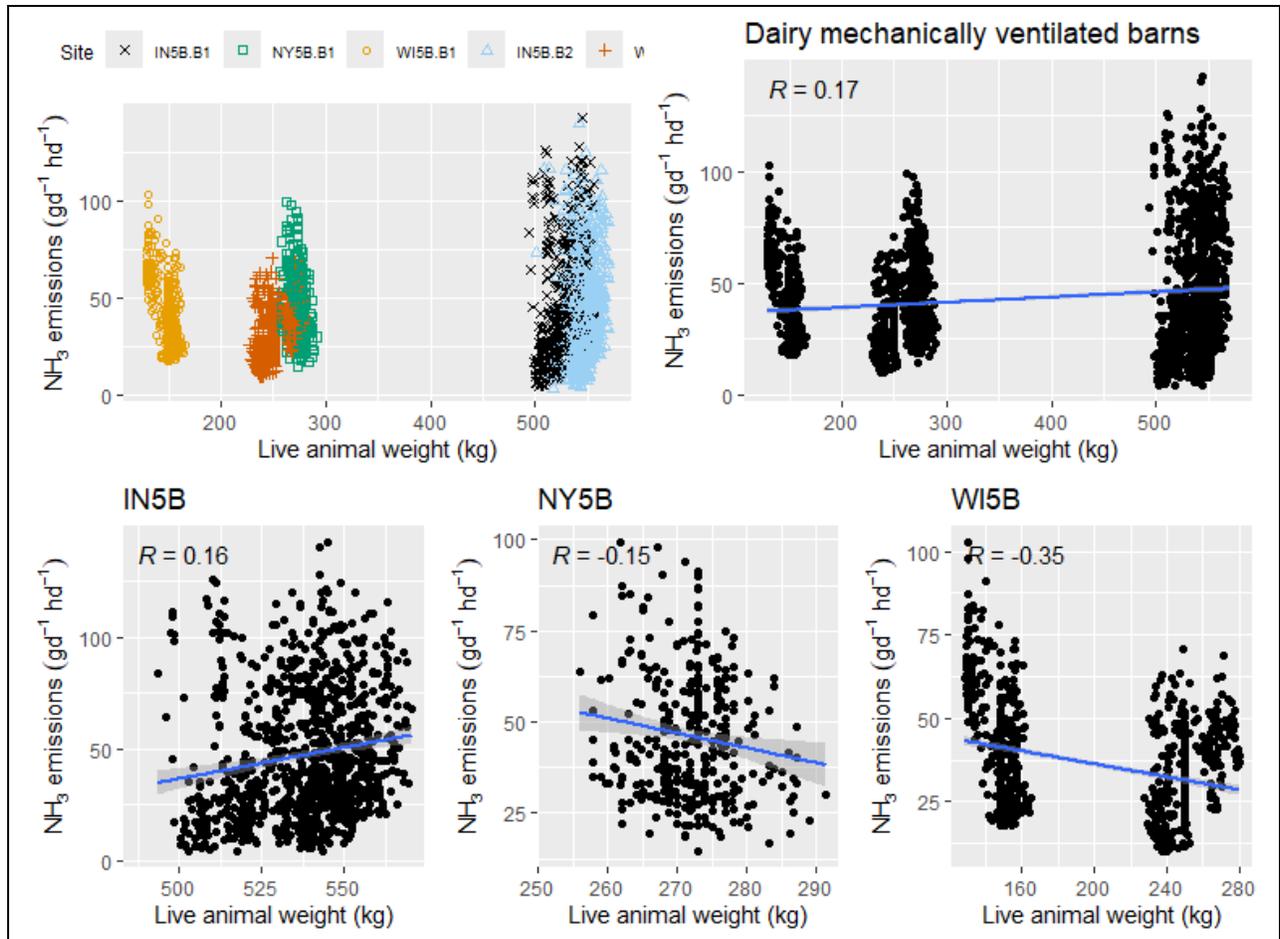


Figure 1.6: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus live animal weight.

1.1.1.4 Exhaust temperature

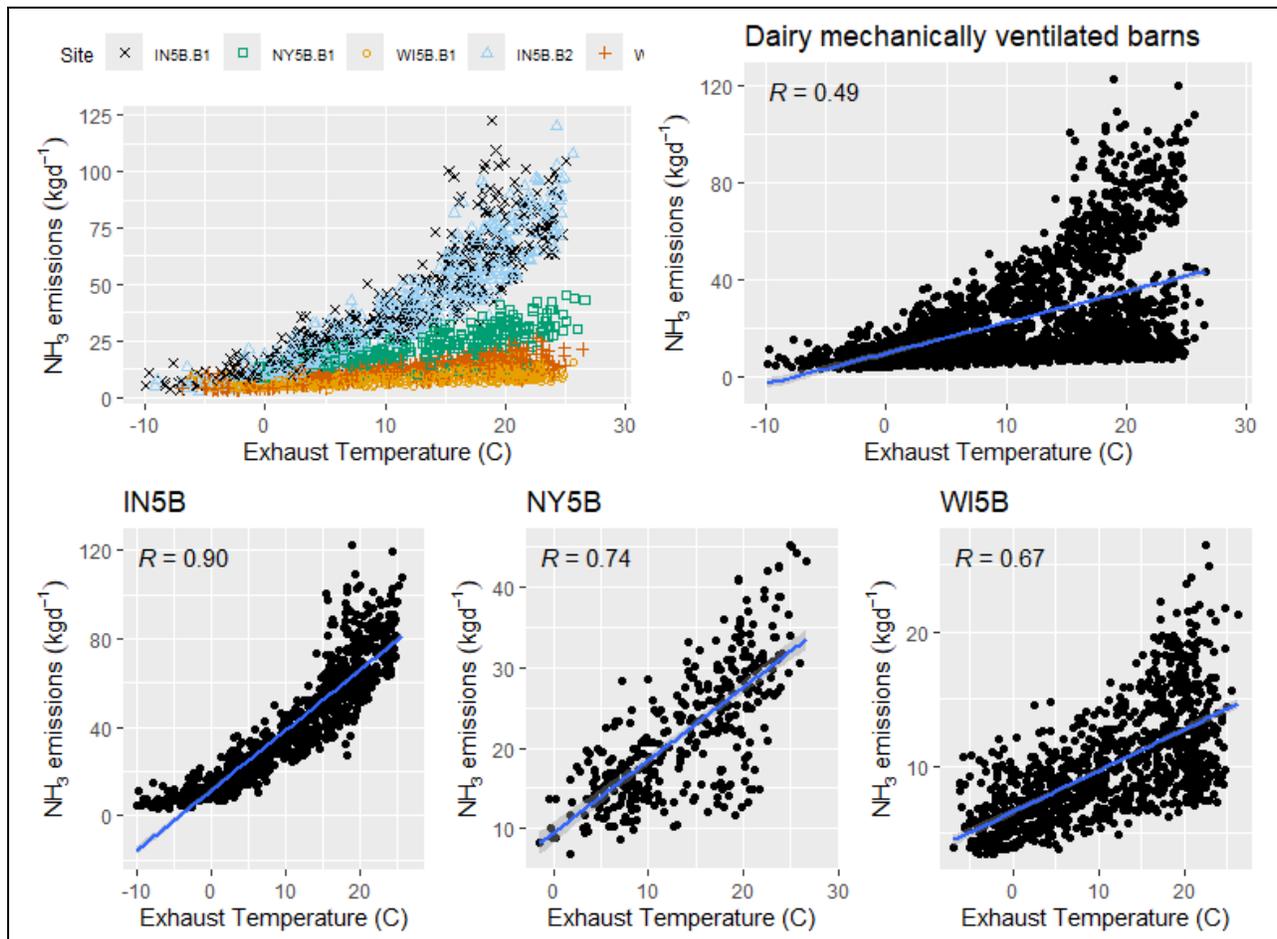


Figure 1.7: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus exhaust temperature.

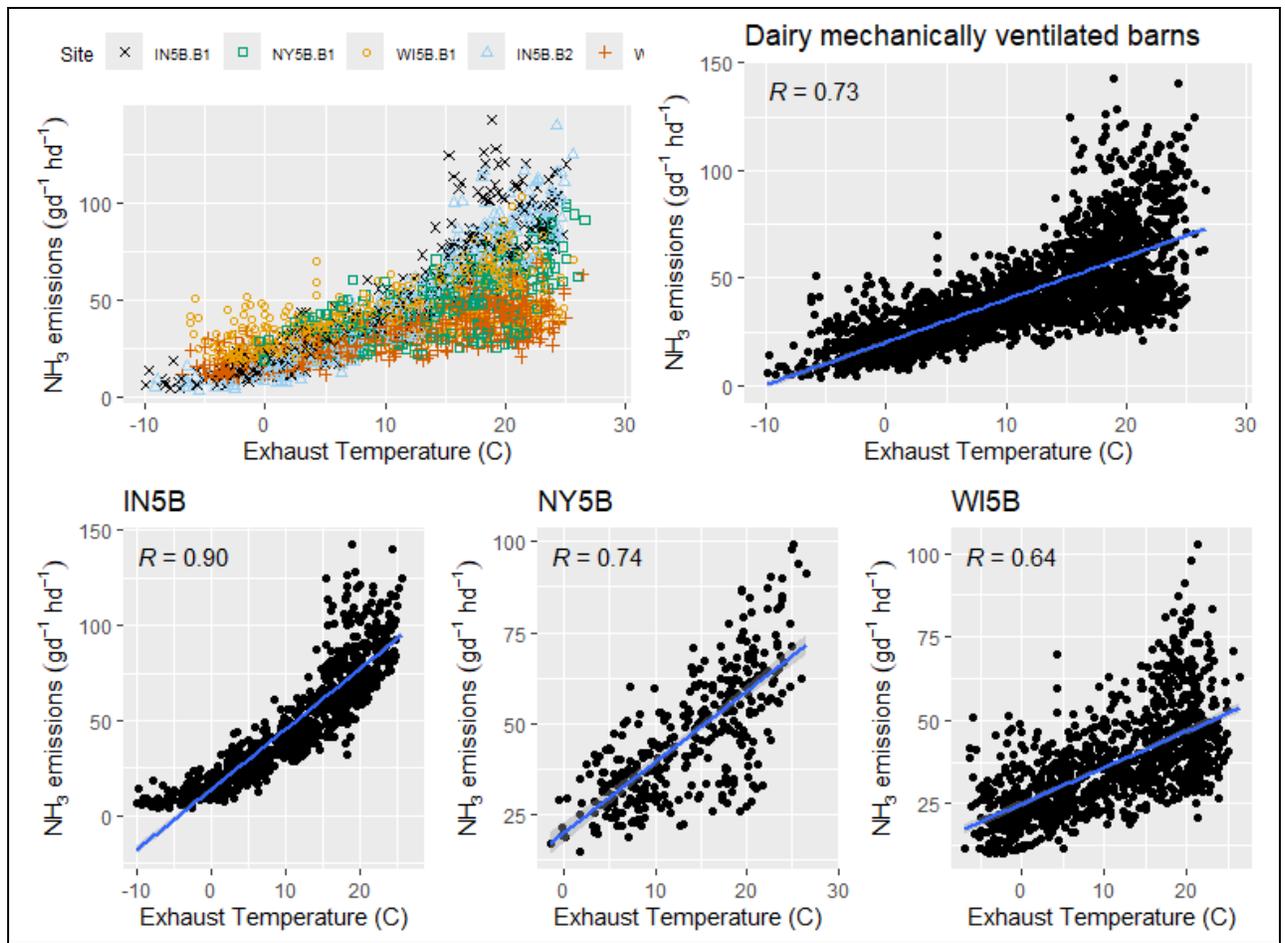


Figure 1.8: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus exhaust temperature.

1.1.1.5 Exhaust relative humidity

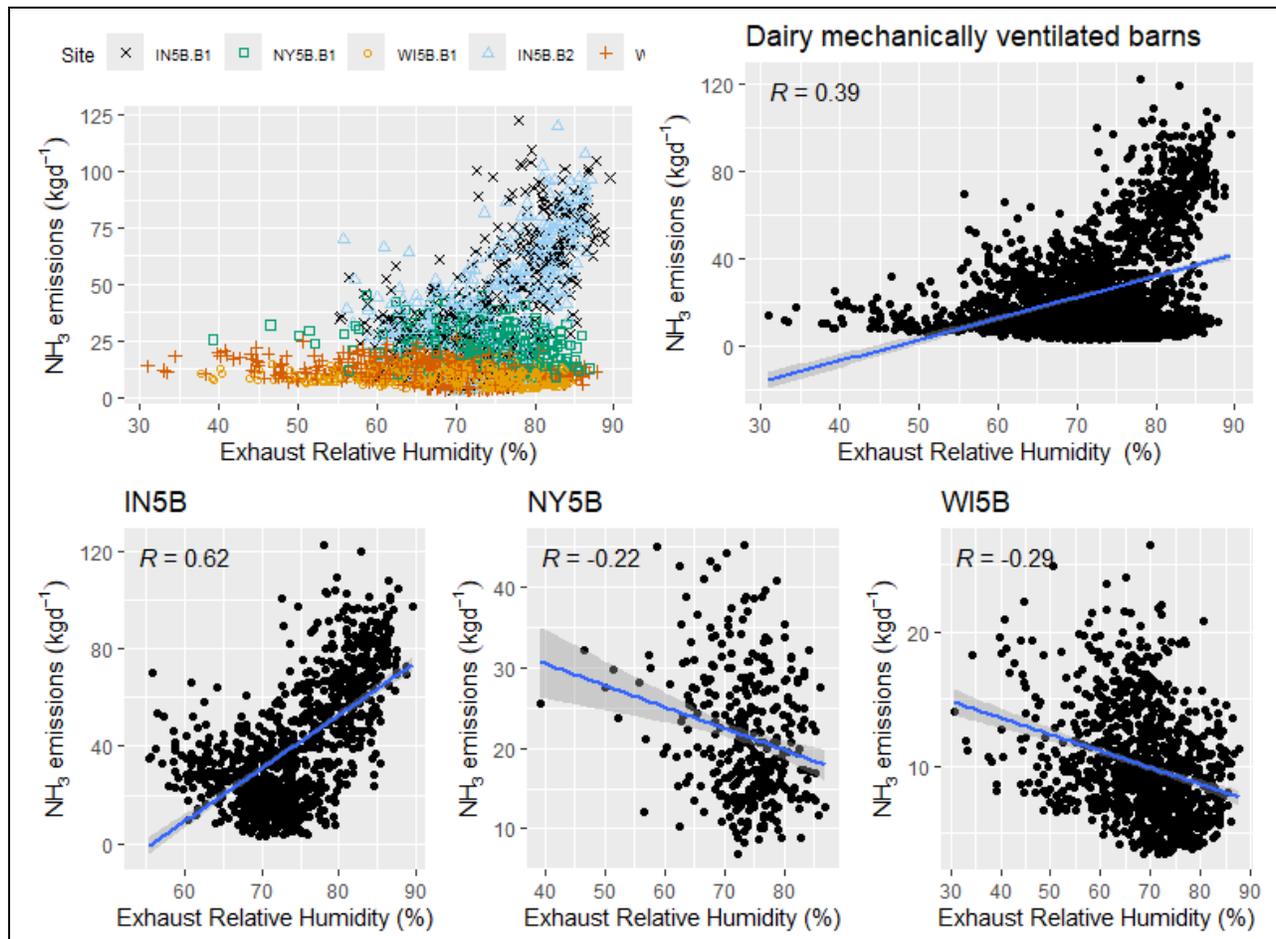


Figure 1.9: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus exhaust relative humidity.

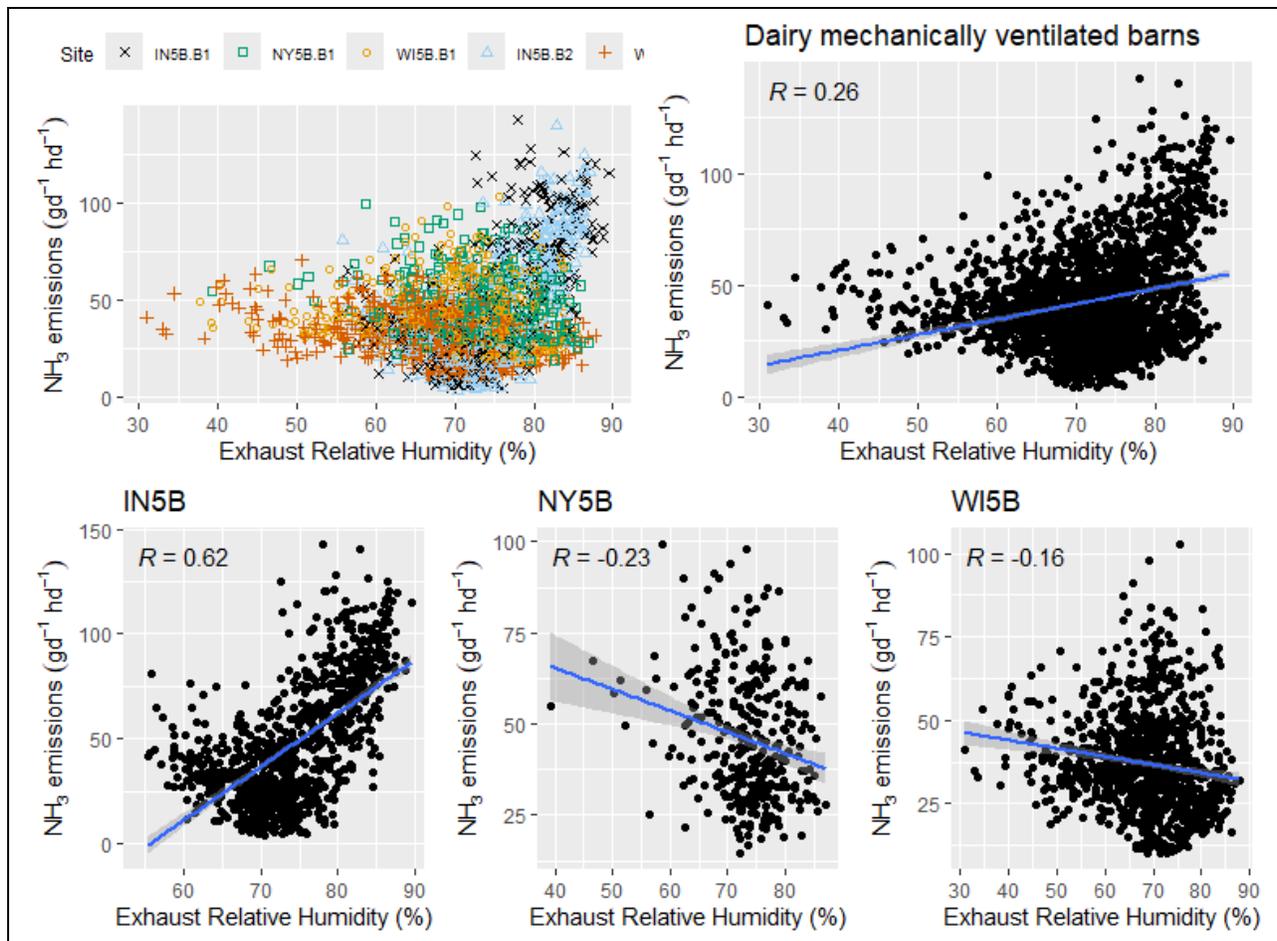


Figure 1.10: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus exhaust relative humidity.

1.1.1.6 Airflow

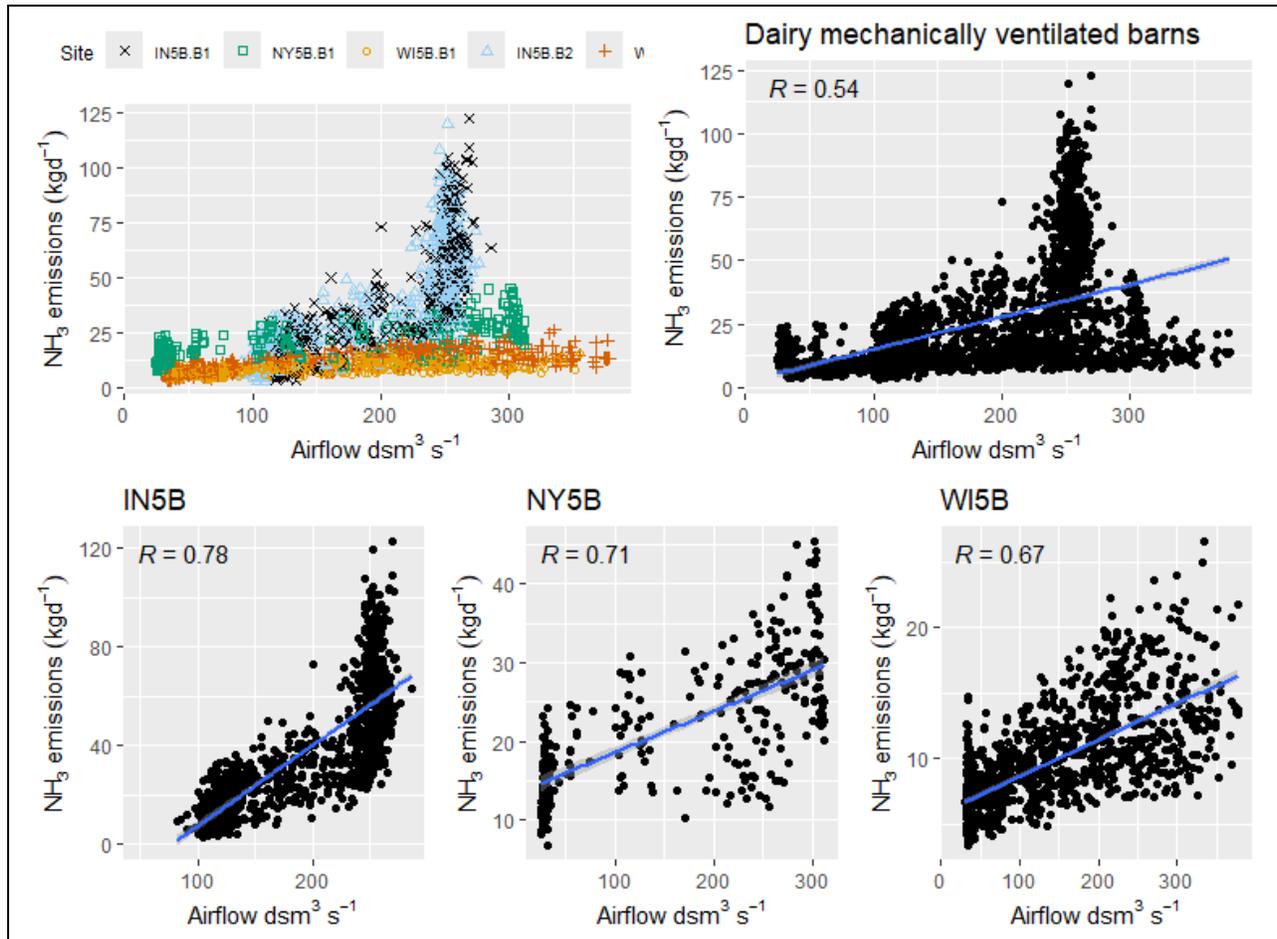
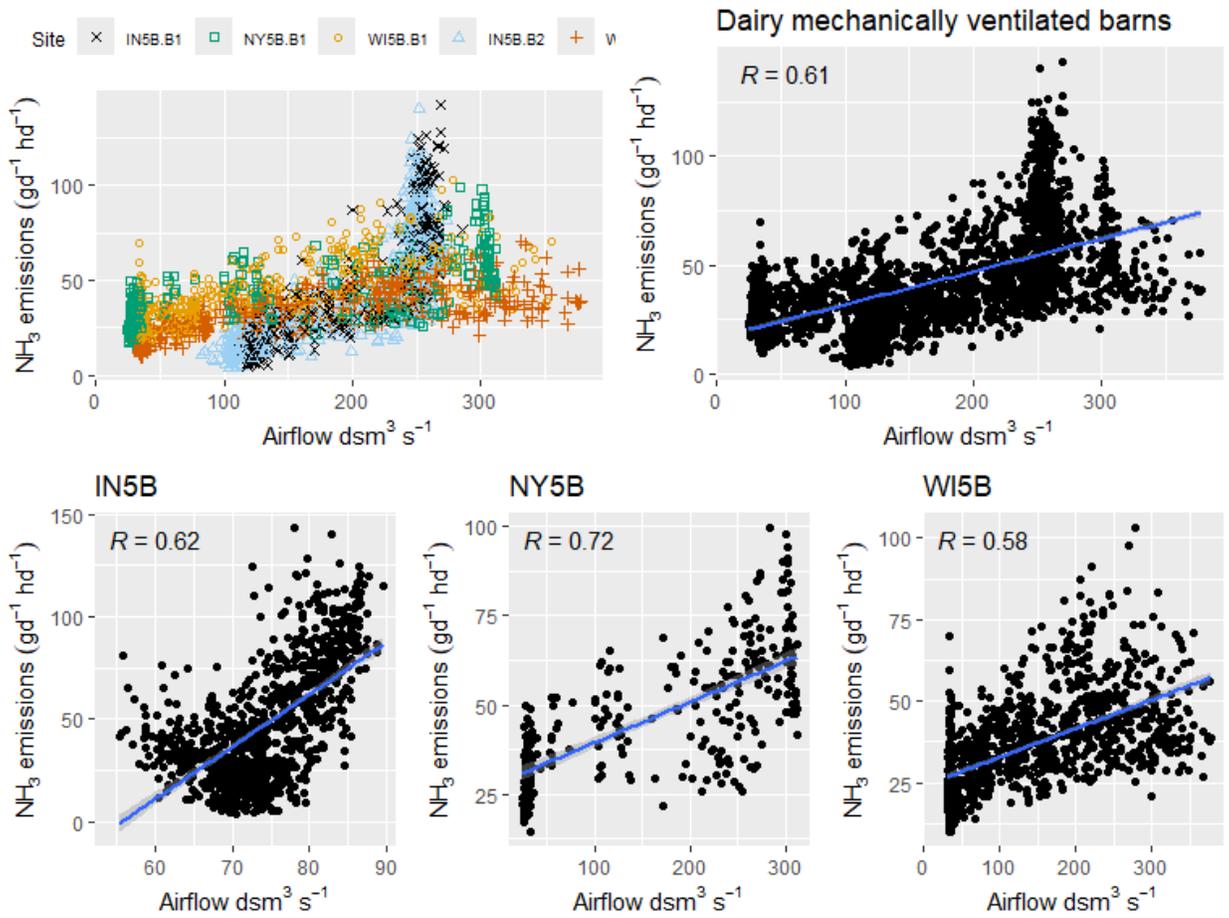


Figure 1.11: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus airflow.



Hydrogen Sulfide (H₂S) #### Inventory

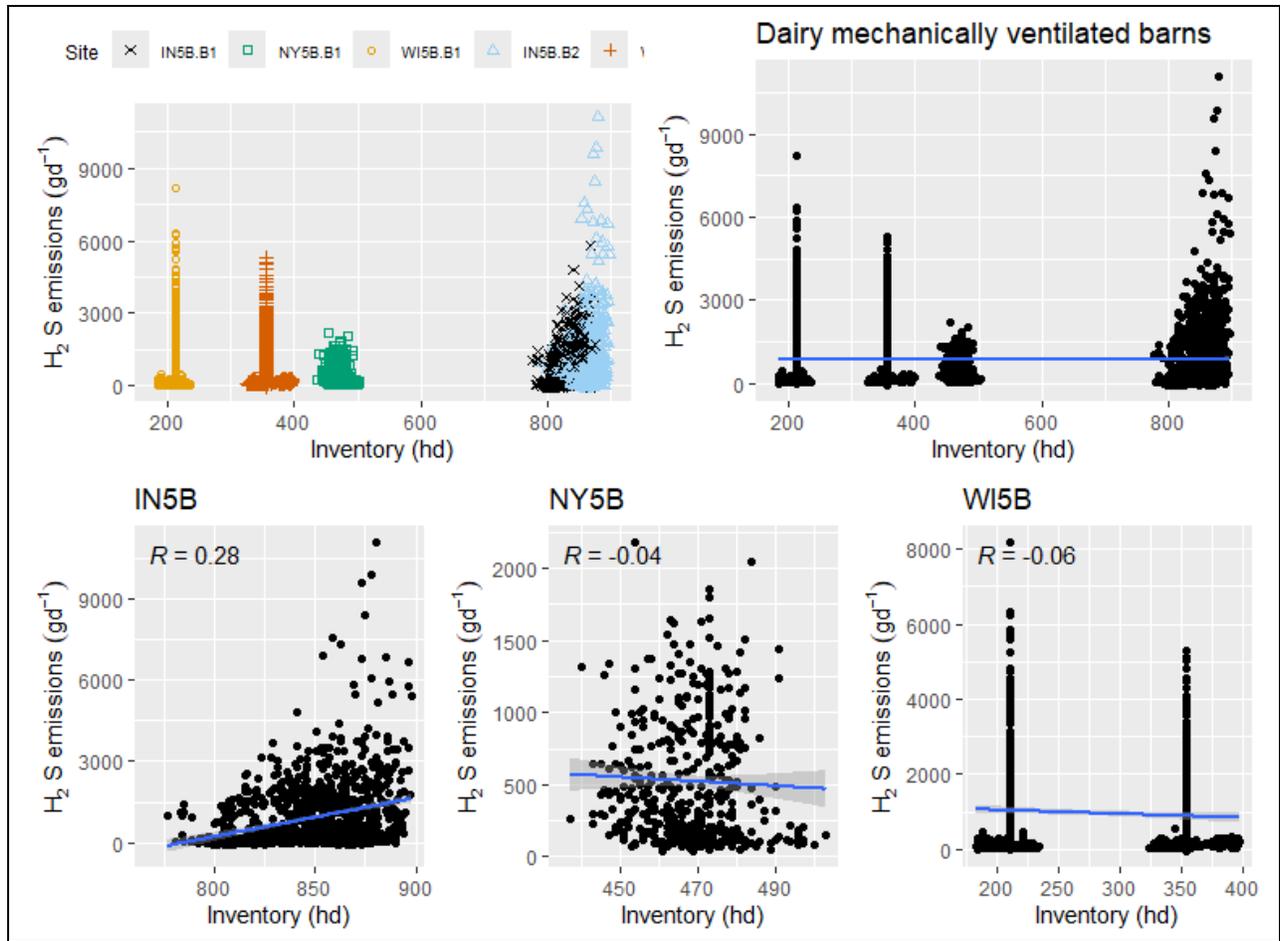


Figure 1.13: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus Inventory.

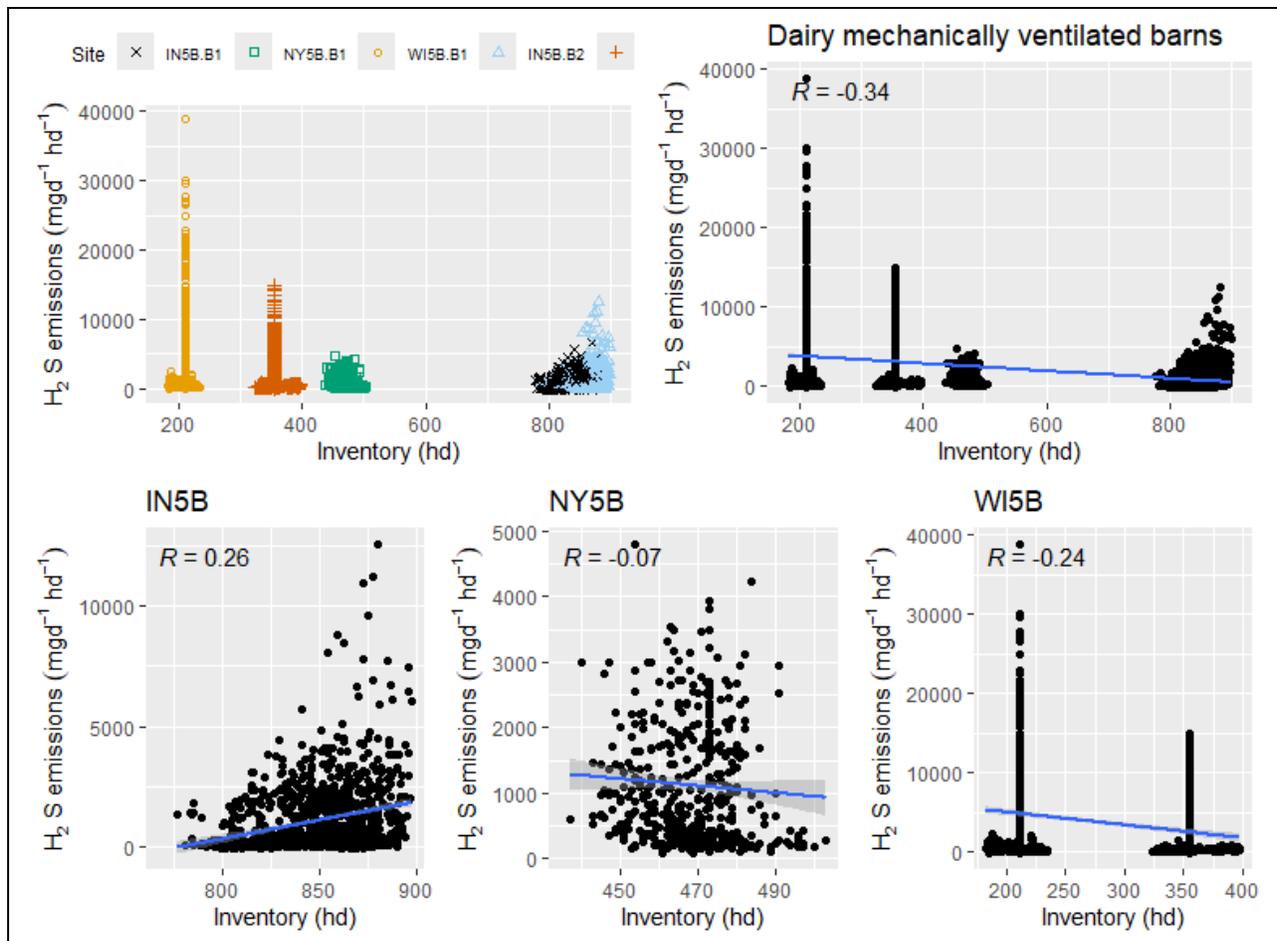


Figure 1.14: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus Inventory.

1.1.1.7 Average animal weight

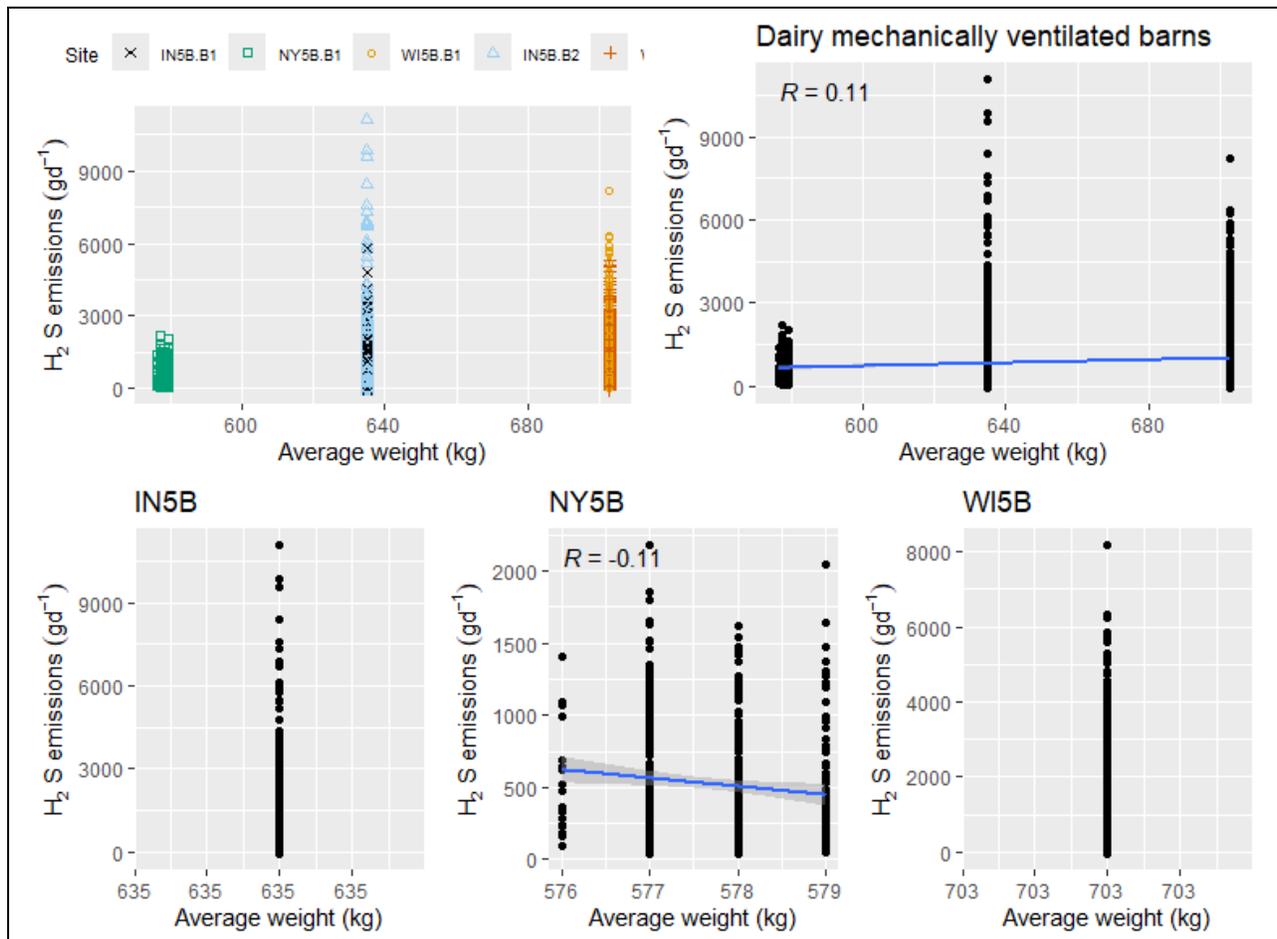


Figure 1.15: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus average animal weight.

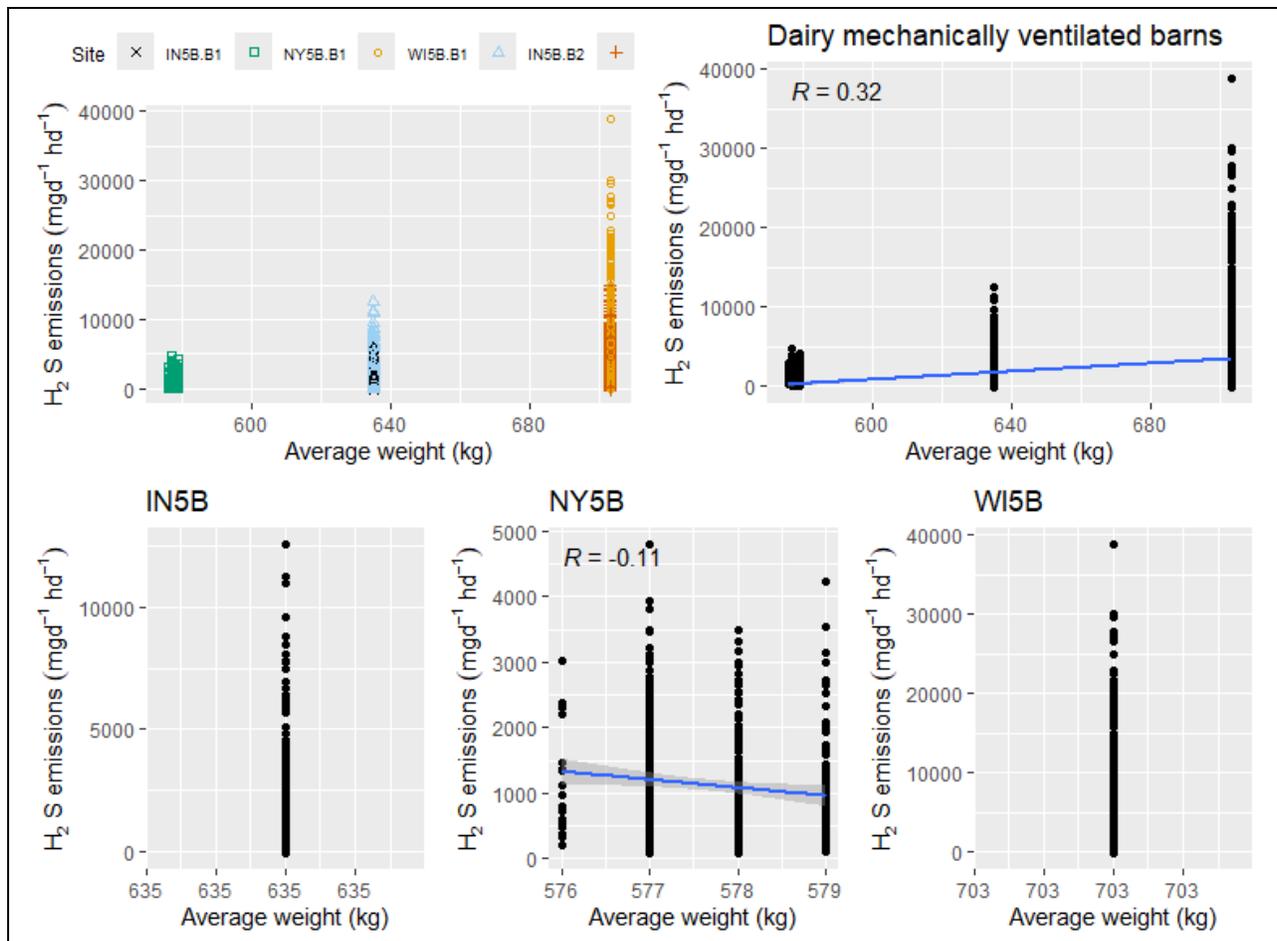


Figure 1.16: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus average animal weight.

1.1.1.8 Live animal weight

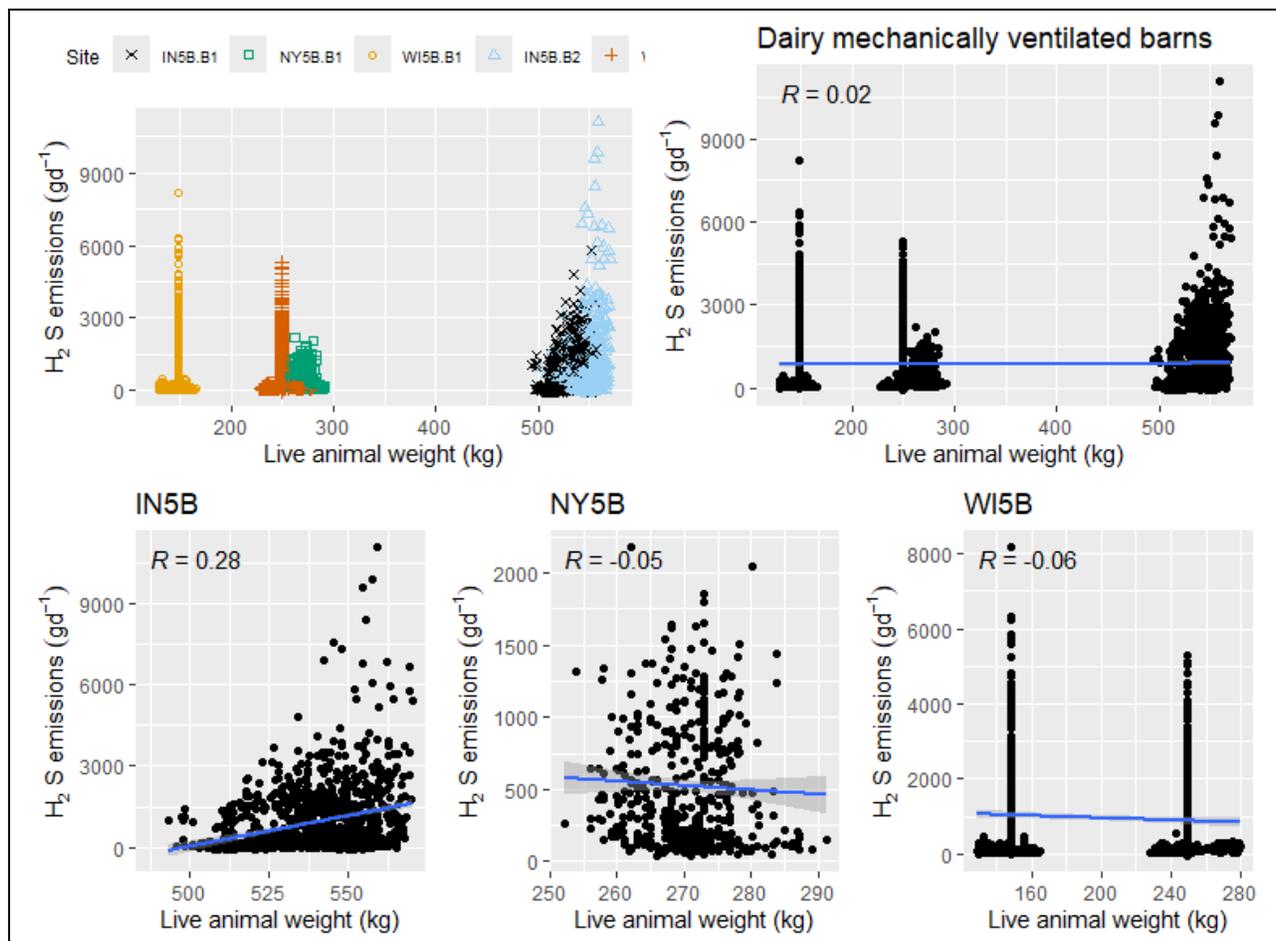


Figure 1.17: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus live animal weight.

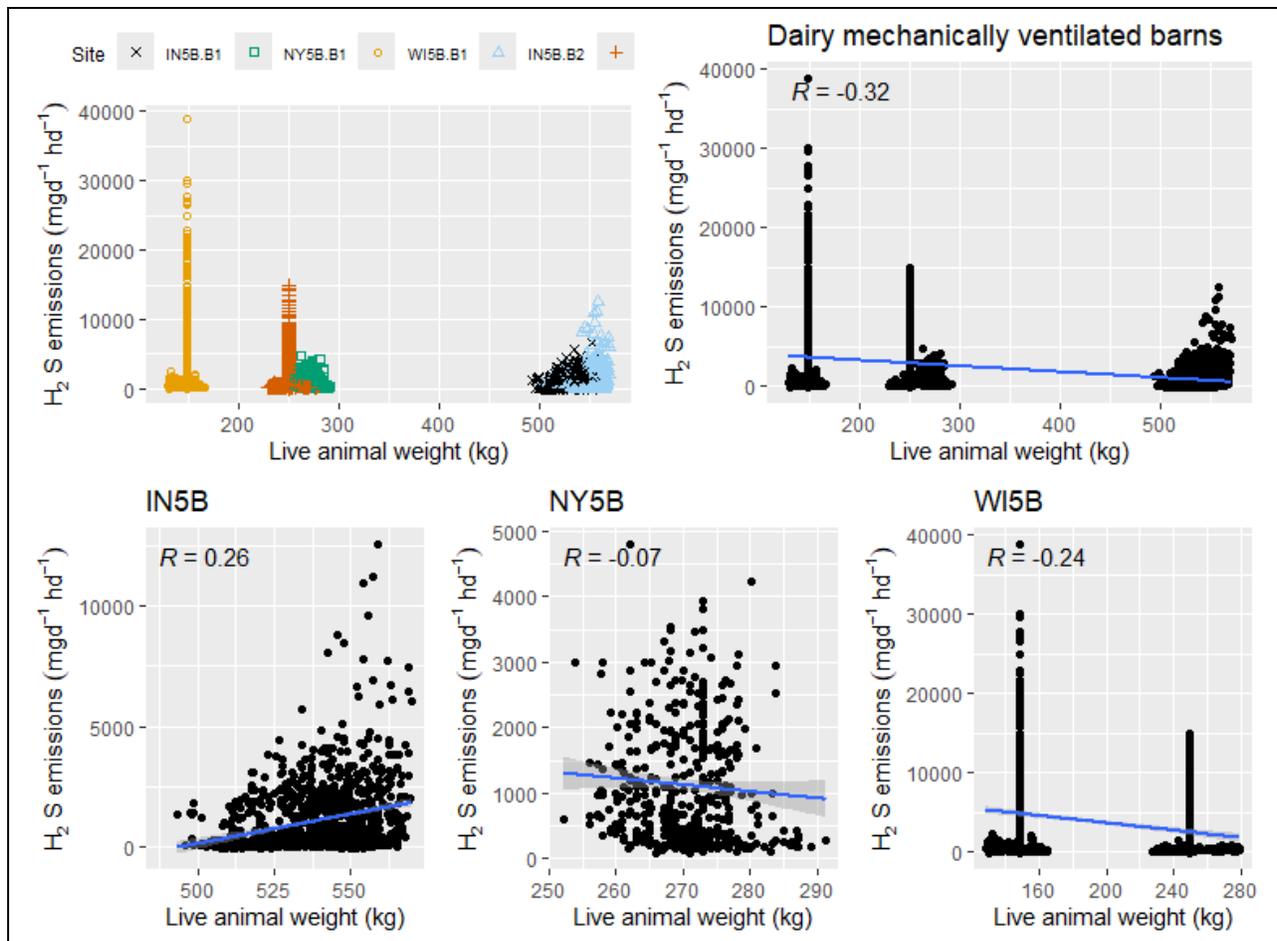


Figure 1.18: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus live animal weight.

1.1.1.9 Exhaust temperature

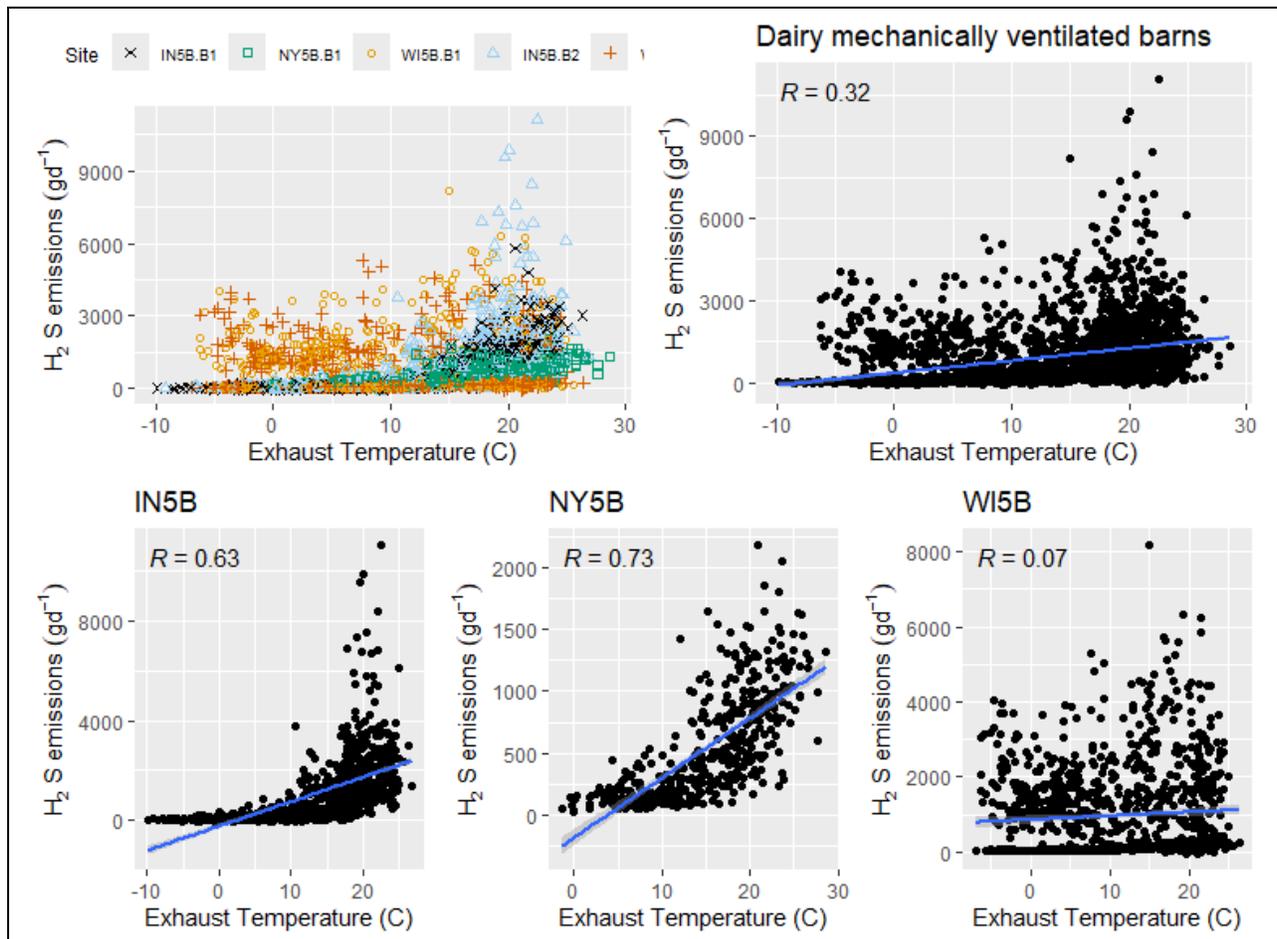


Figure 1.19: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus exhaust temperature.

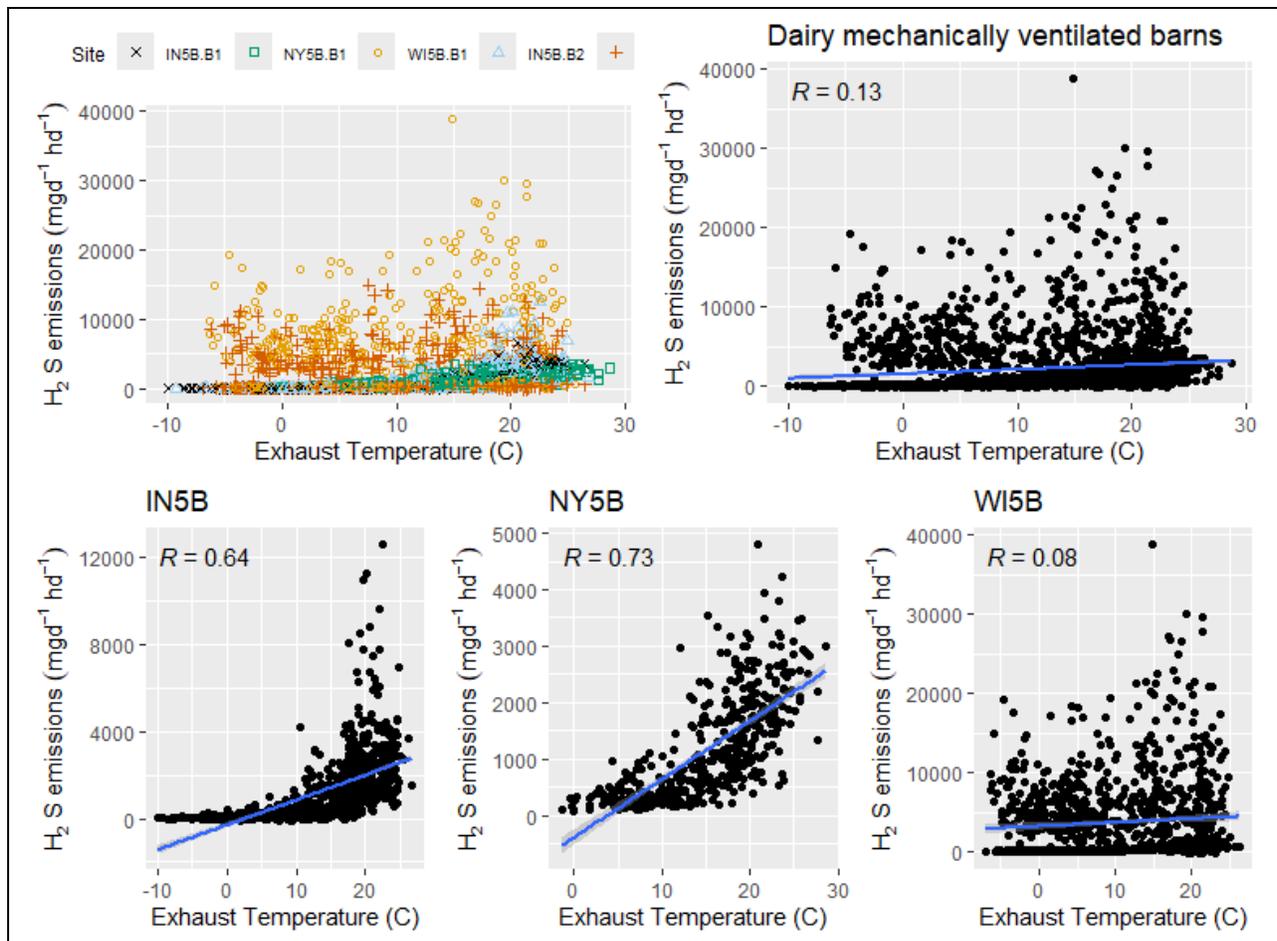


Figure 1.20: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

1.1.1.10 Exhaust relative humidity

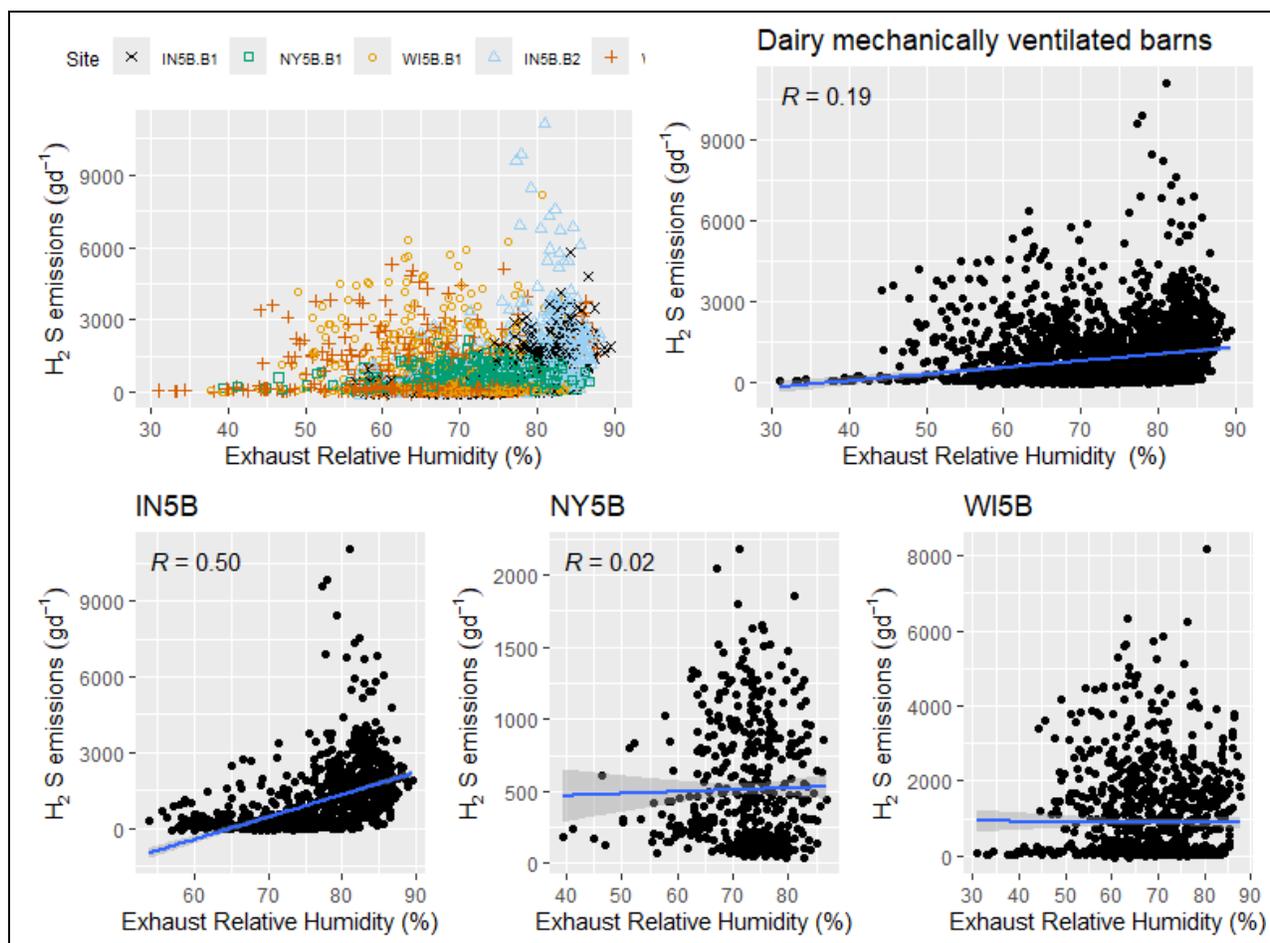


Figure 1.21: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus exhaust relative humidity.

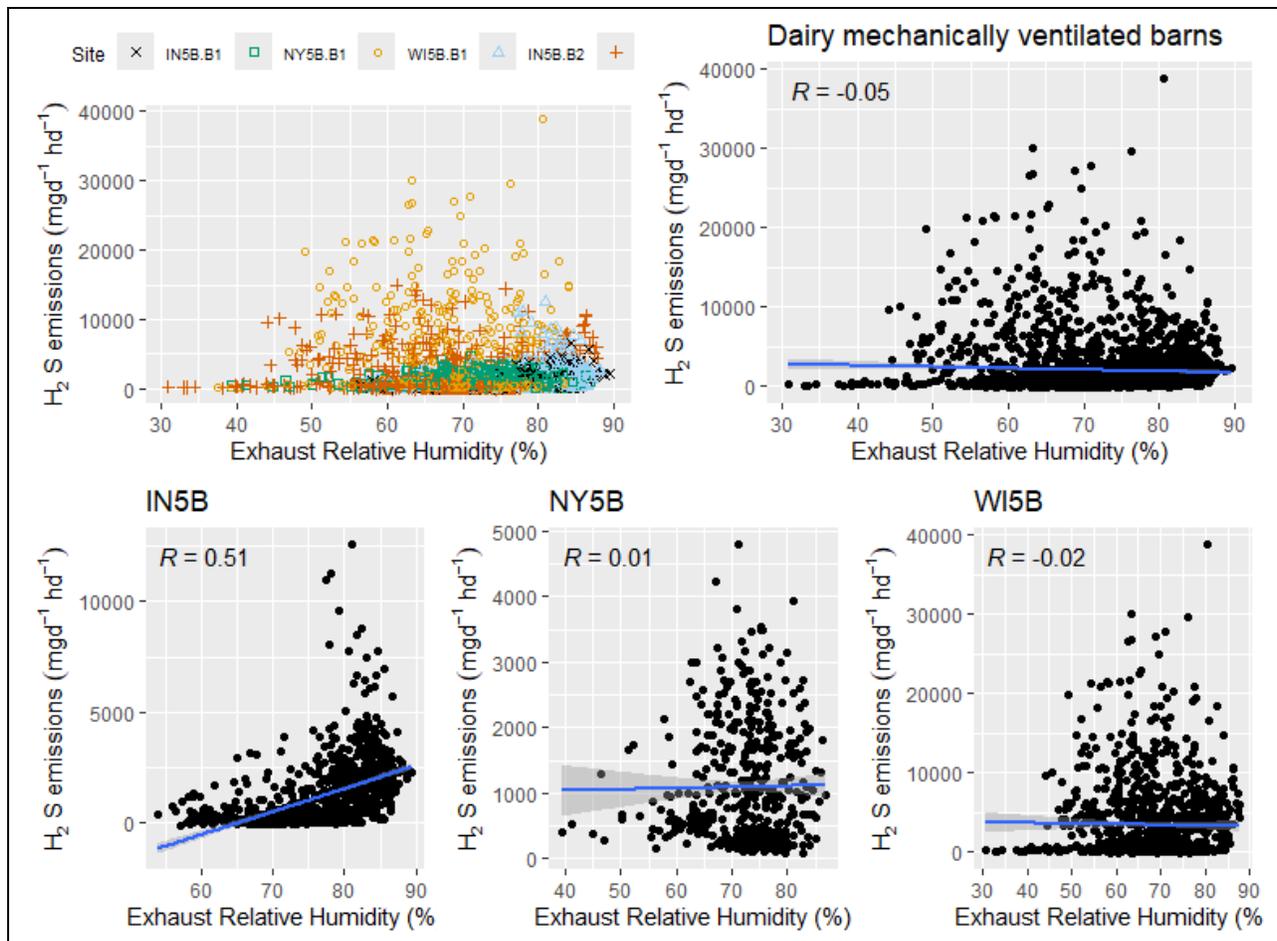


Figure 1.22: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

1.1.1.11 Airflow

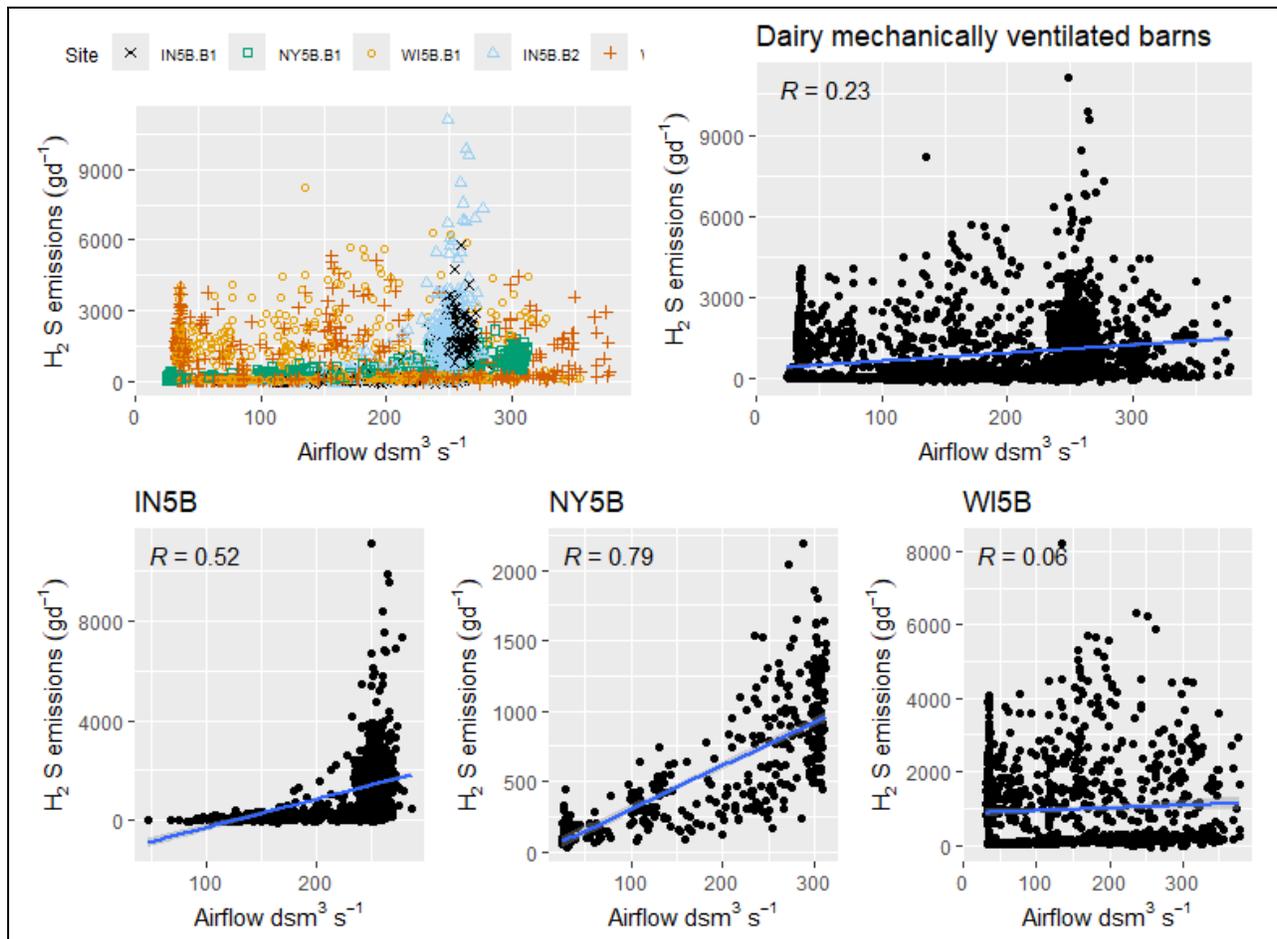


Figure 1.23: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus airflow.

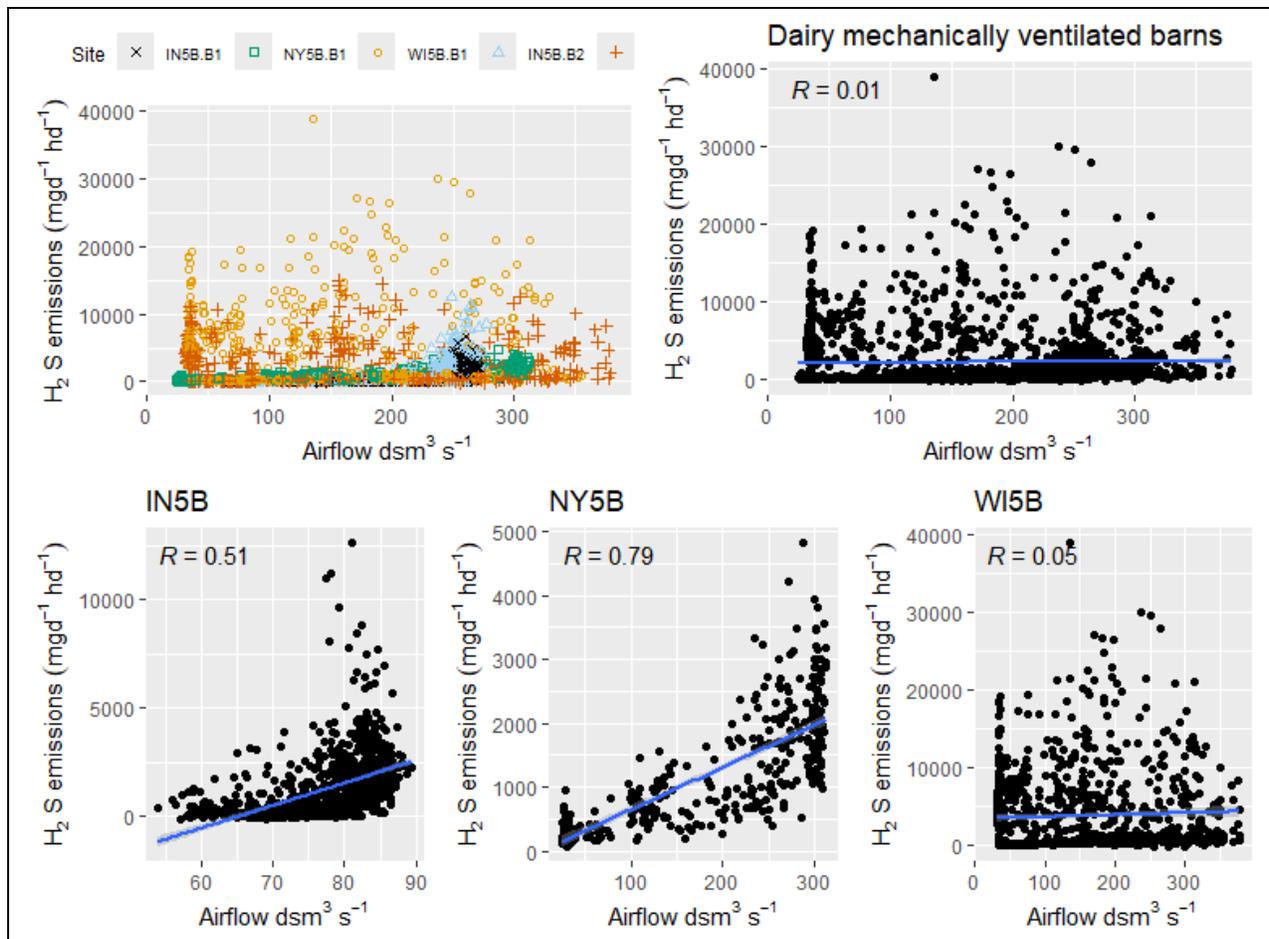


Figure 1.24: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus airflow.

1.1.2 Particulate Matter (PM₁₀)

1.1.2.1 Inventory

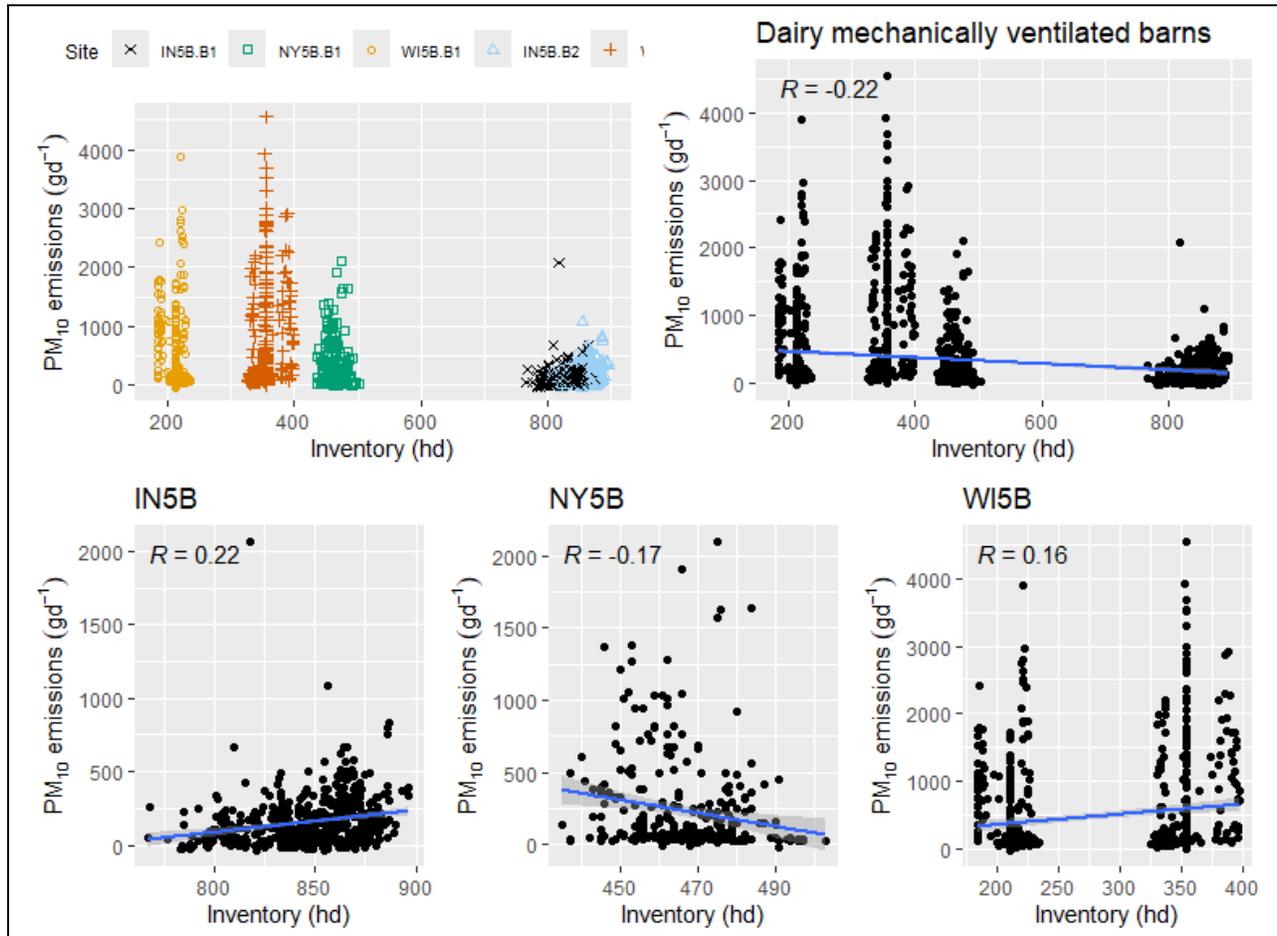


Figure 1.25: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus Inventory.

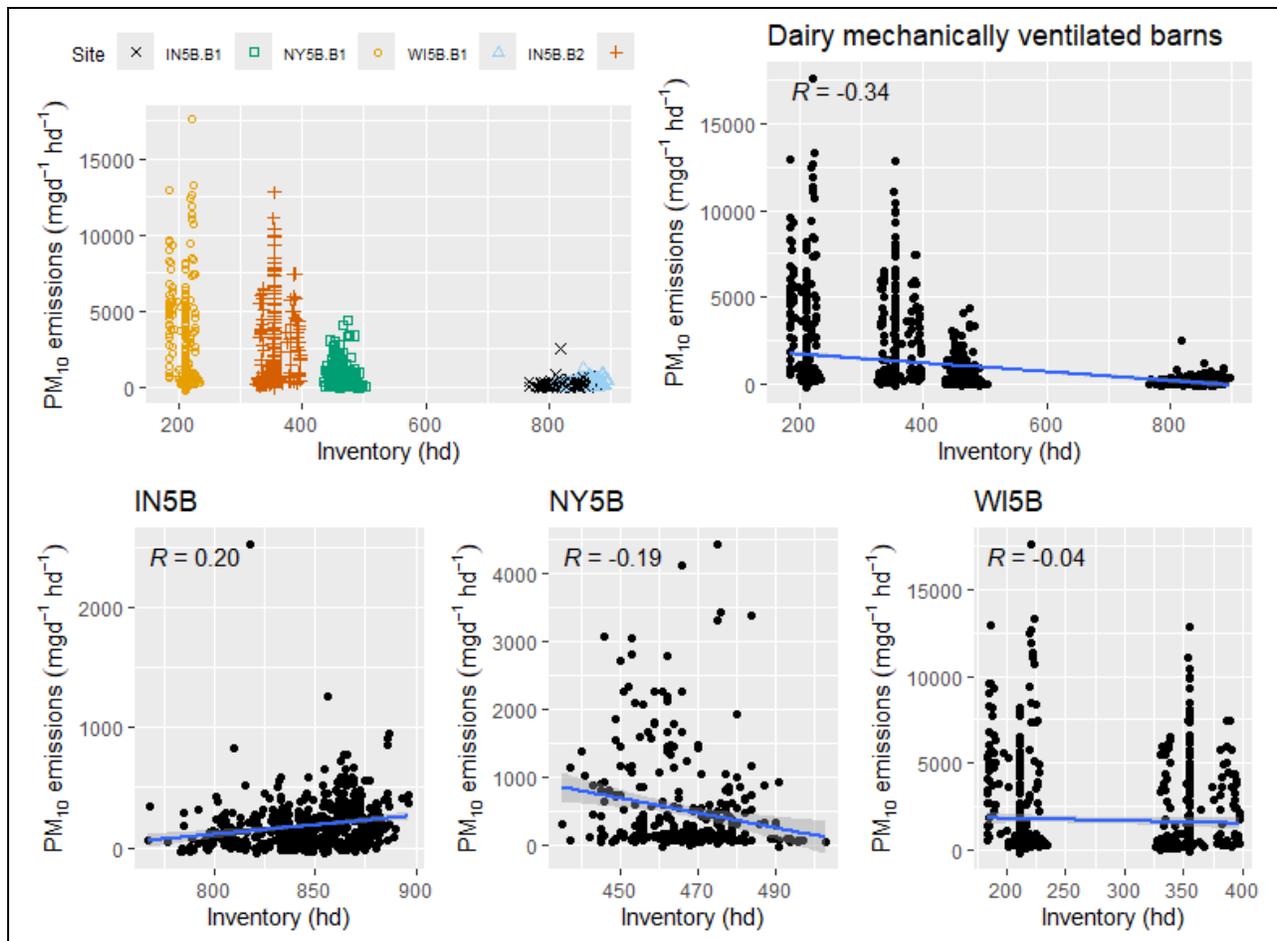


Figure 1.26: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus Inventory.

1.1.2.2 Average animal weight

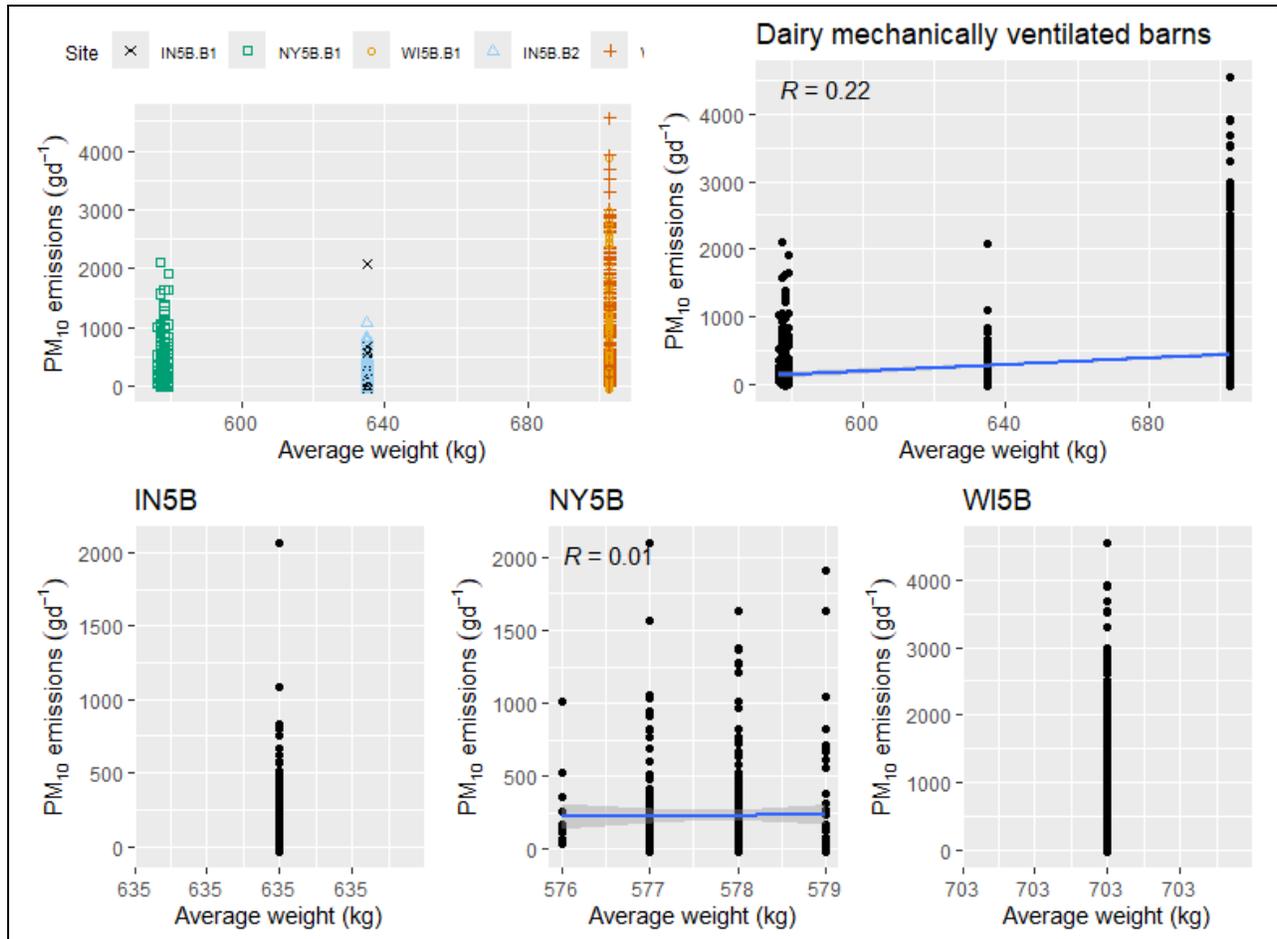


Figure 1.27: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus average animal weight.

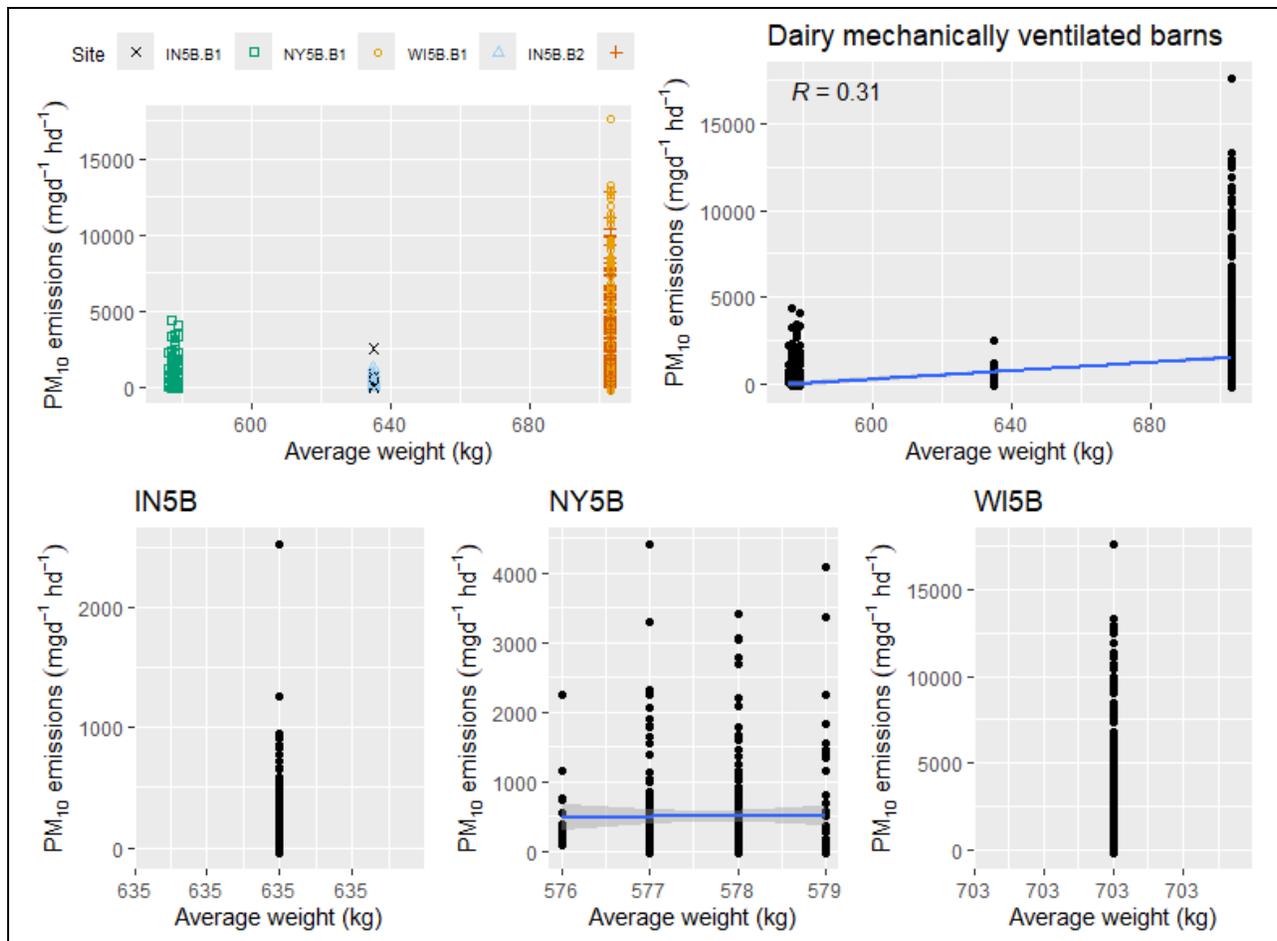


Figure 1.28: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus average animal weight.

1.1.2.3 Live animal weight

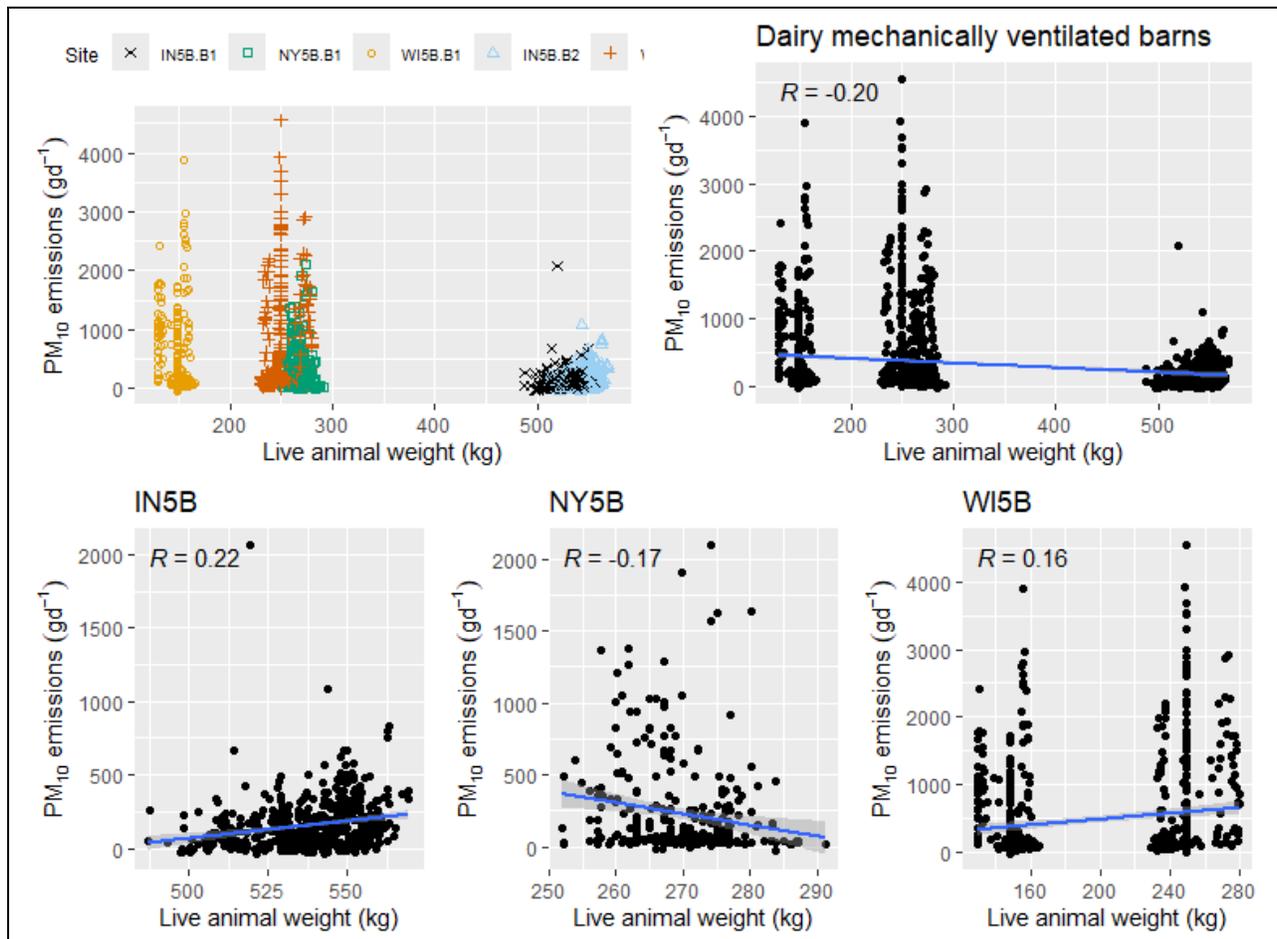


Figure 1.29: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus live animal weight.

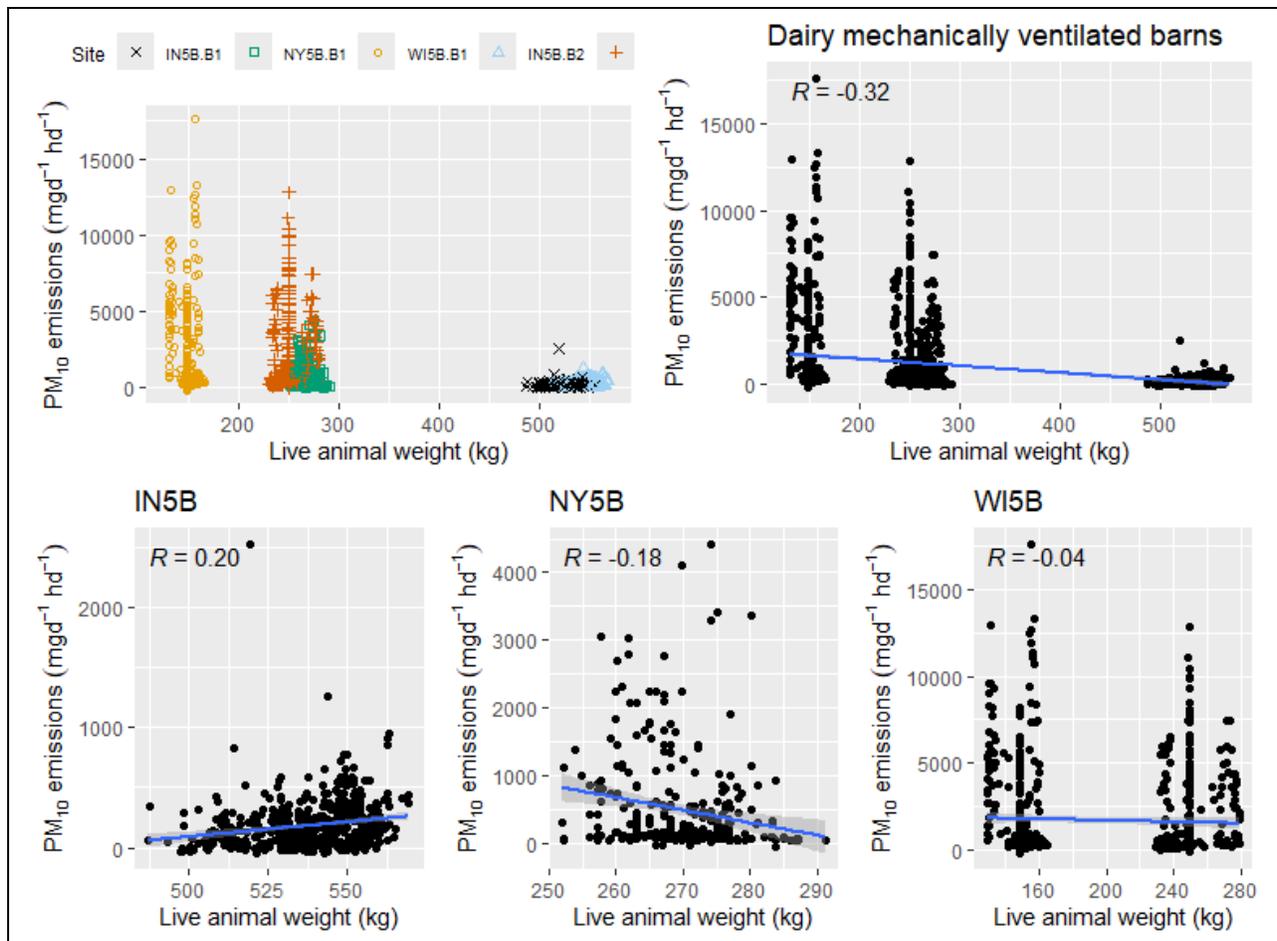


Figure 1.30: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus live animal weight.

1.1.2.4 Exhaust temperature

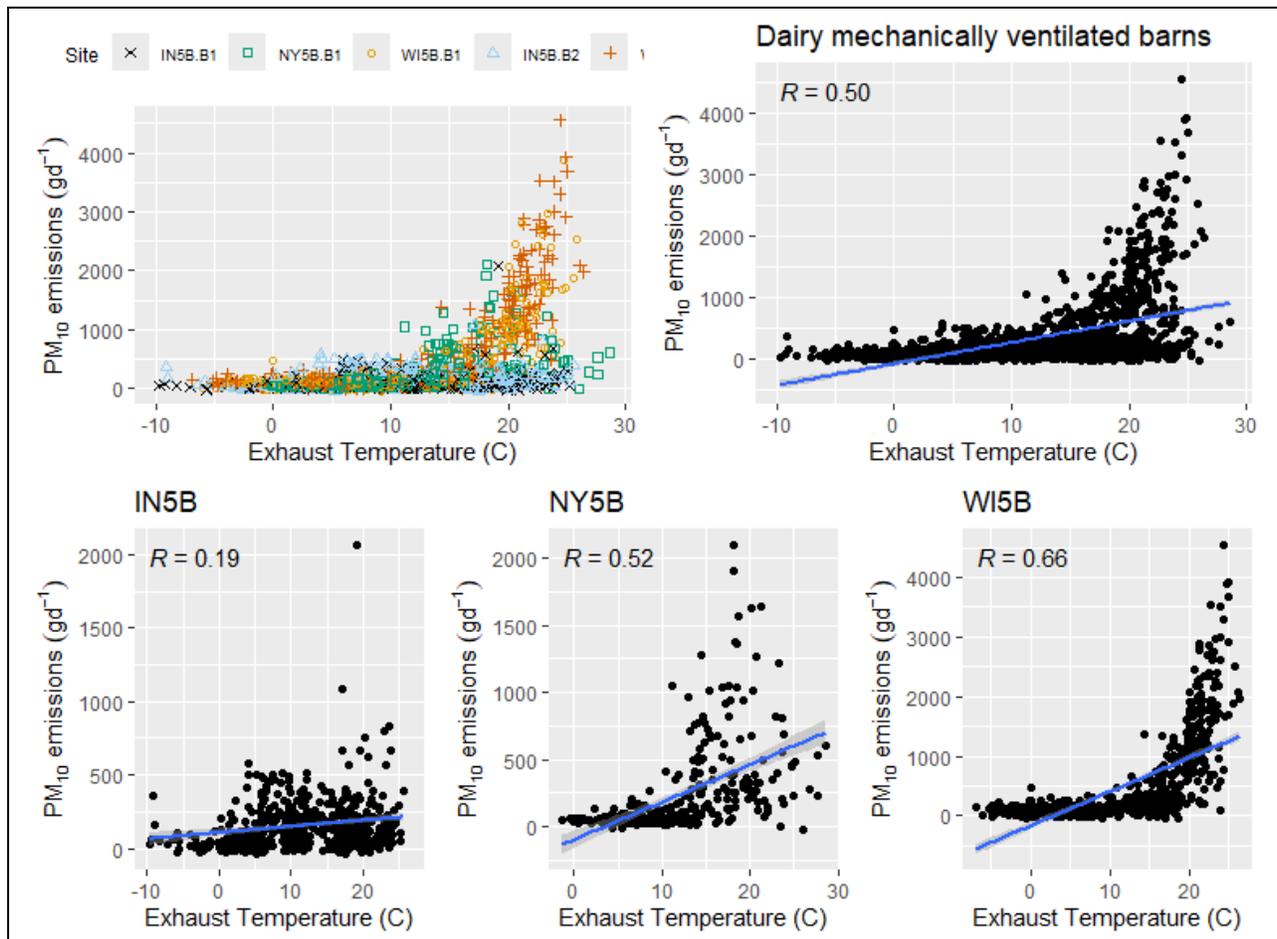


Figure 1.31: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus exhaust temperature.

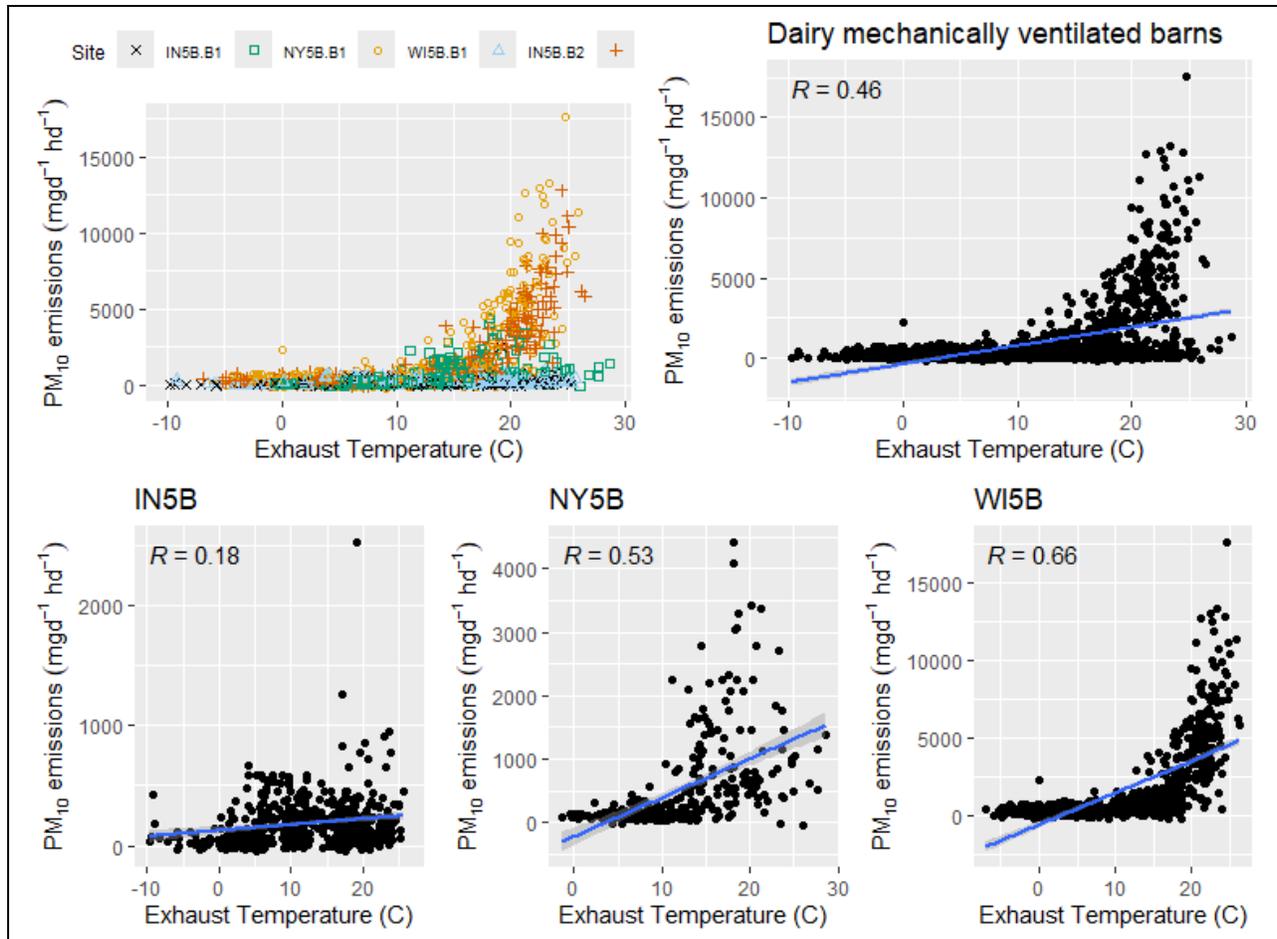


Figure 1.32: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

1.1.2.5 Exhaust relative humidity

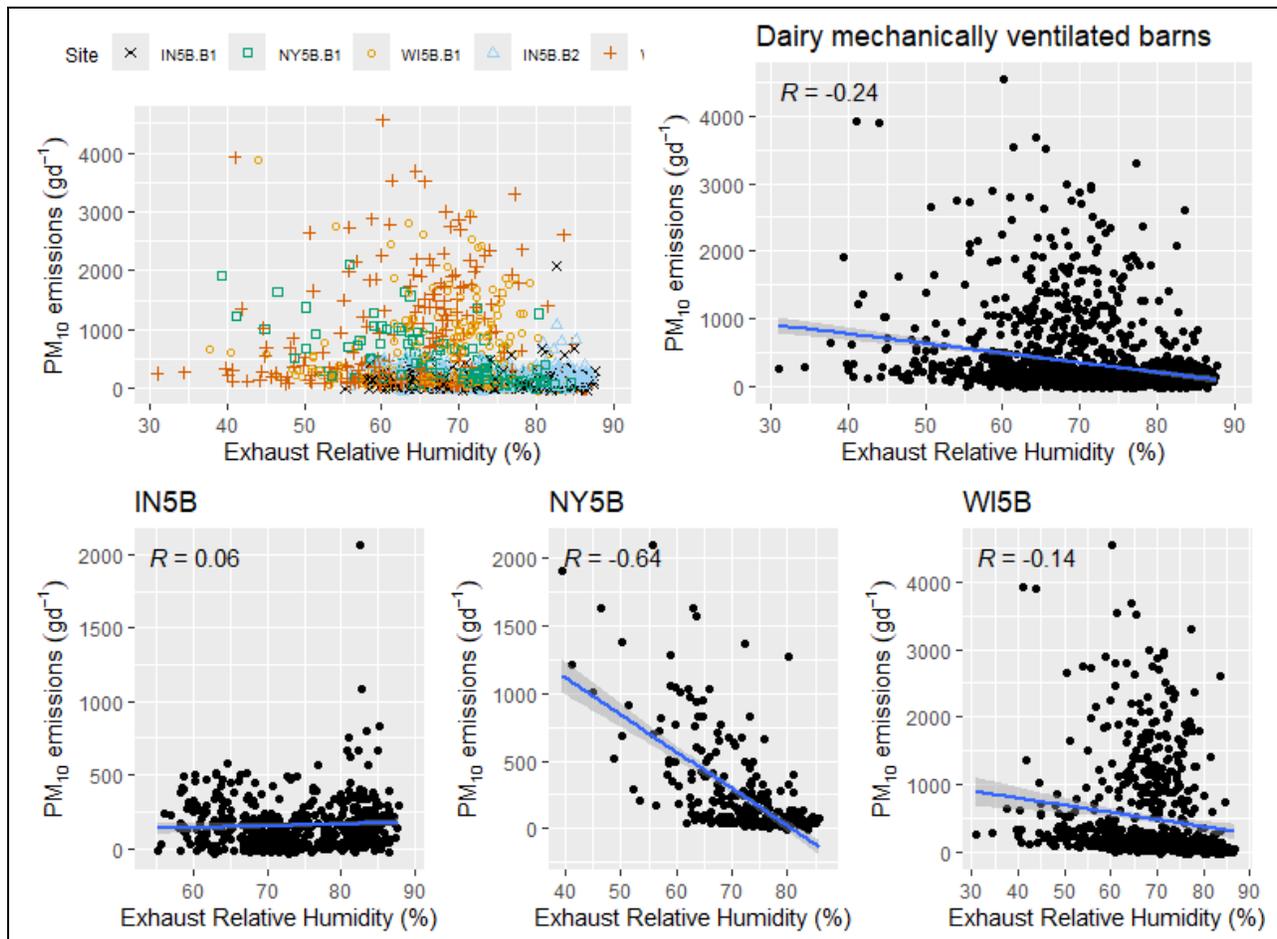


Figure 1.33: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus exhaust relative humidity.

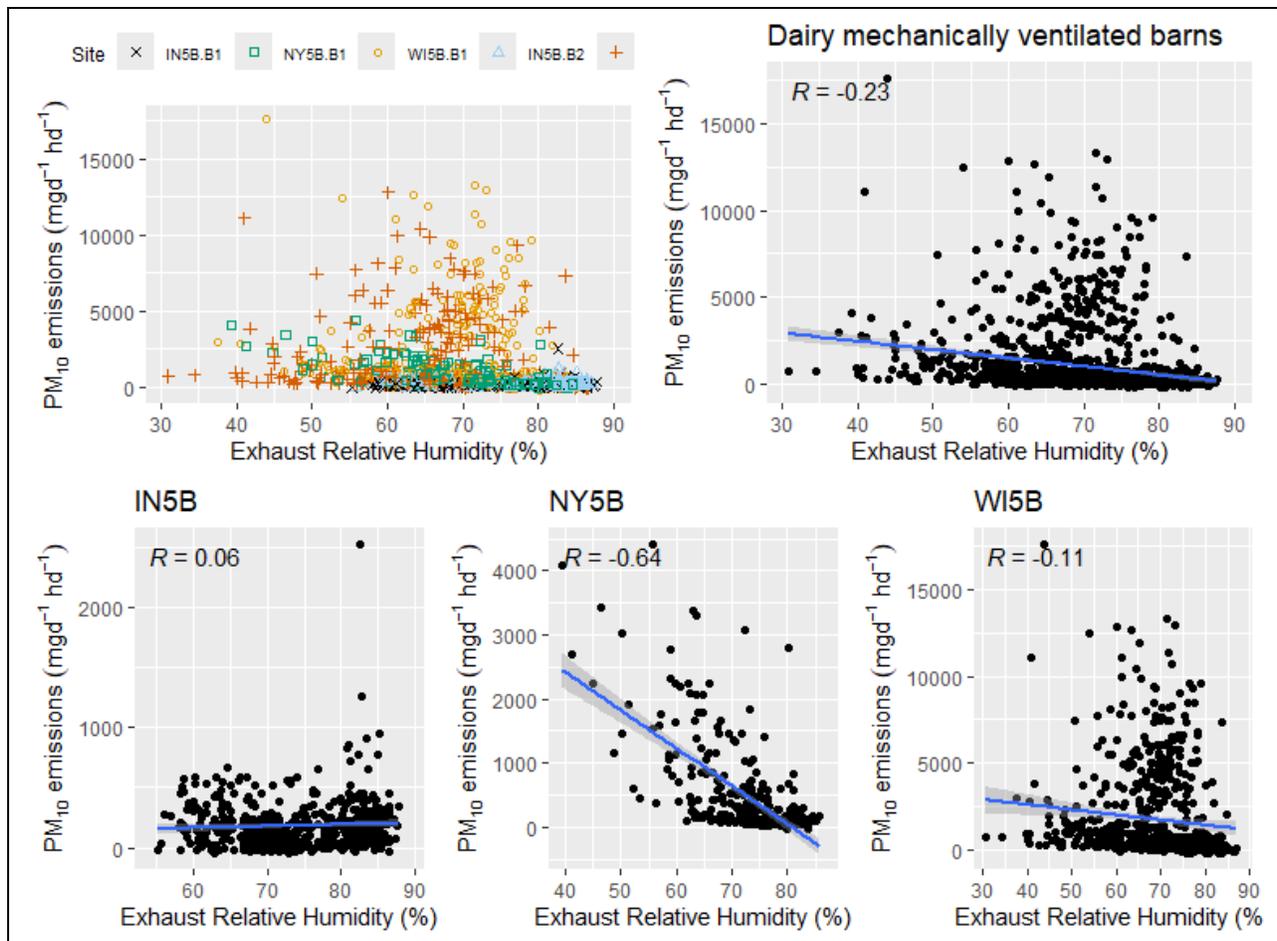


Figure 1.34: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

1.1.2.6 Airflow

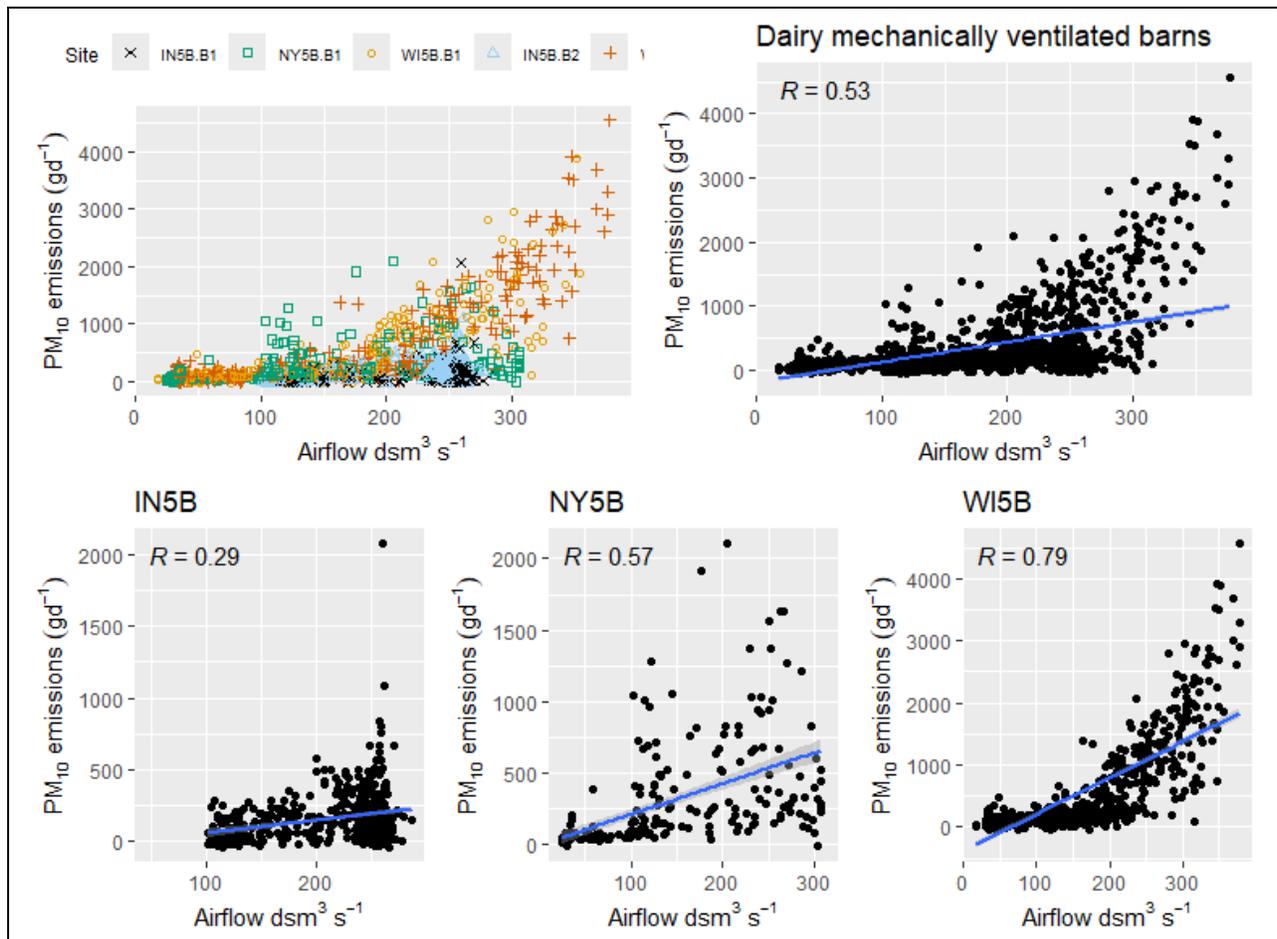


Figure 1.35: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d^{-1}) versus airflow.

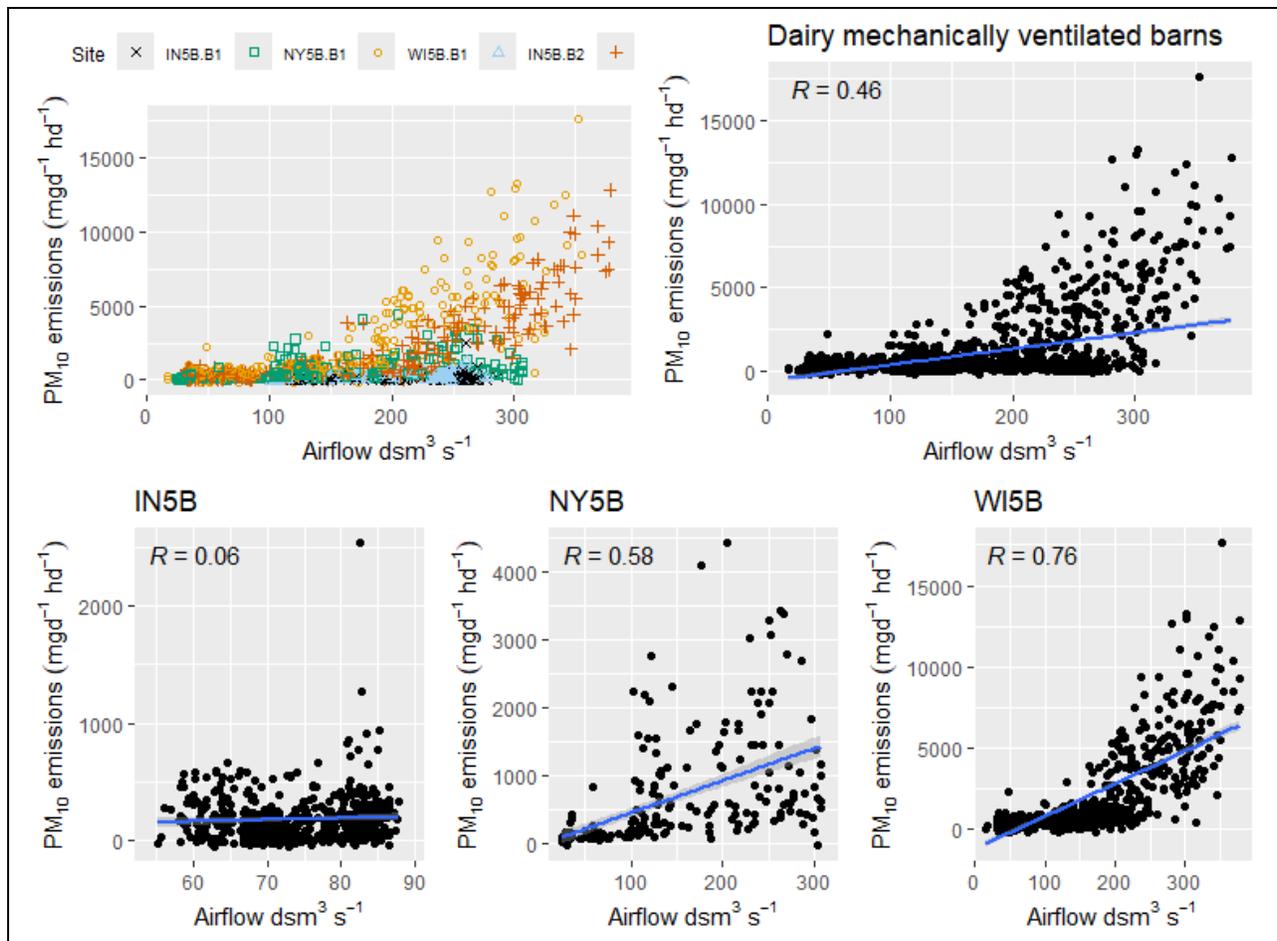


Figure 1.36: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus airflow.

1.1.3 Particulate Matter (PM_{2.5})

1.1.3.1 Inventory

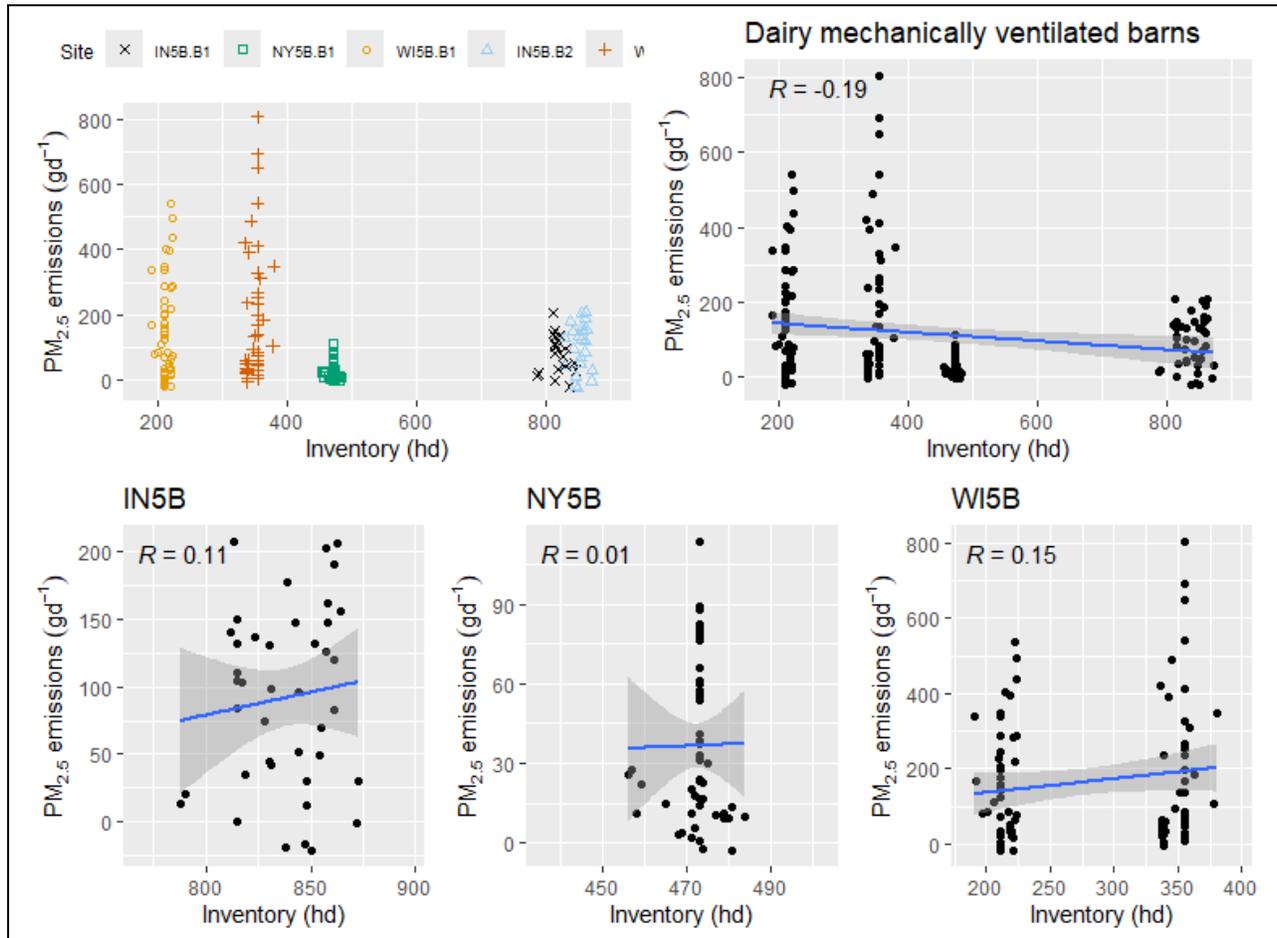


Figure 1.37: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus Inventory.

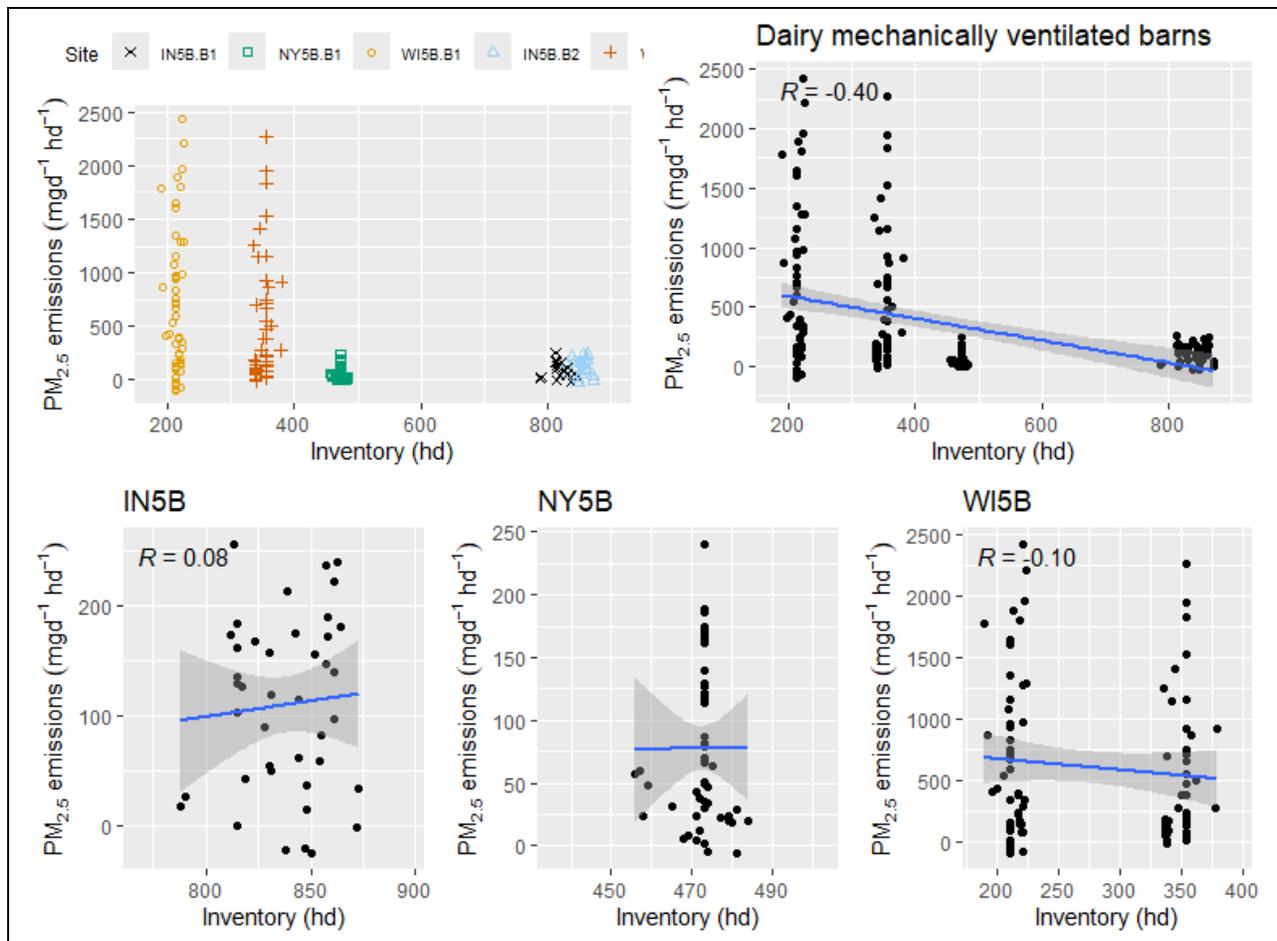


Figure 1.38: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus Inventory.

1.1.3.2 Average animal weight

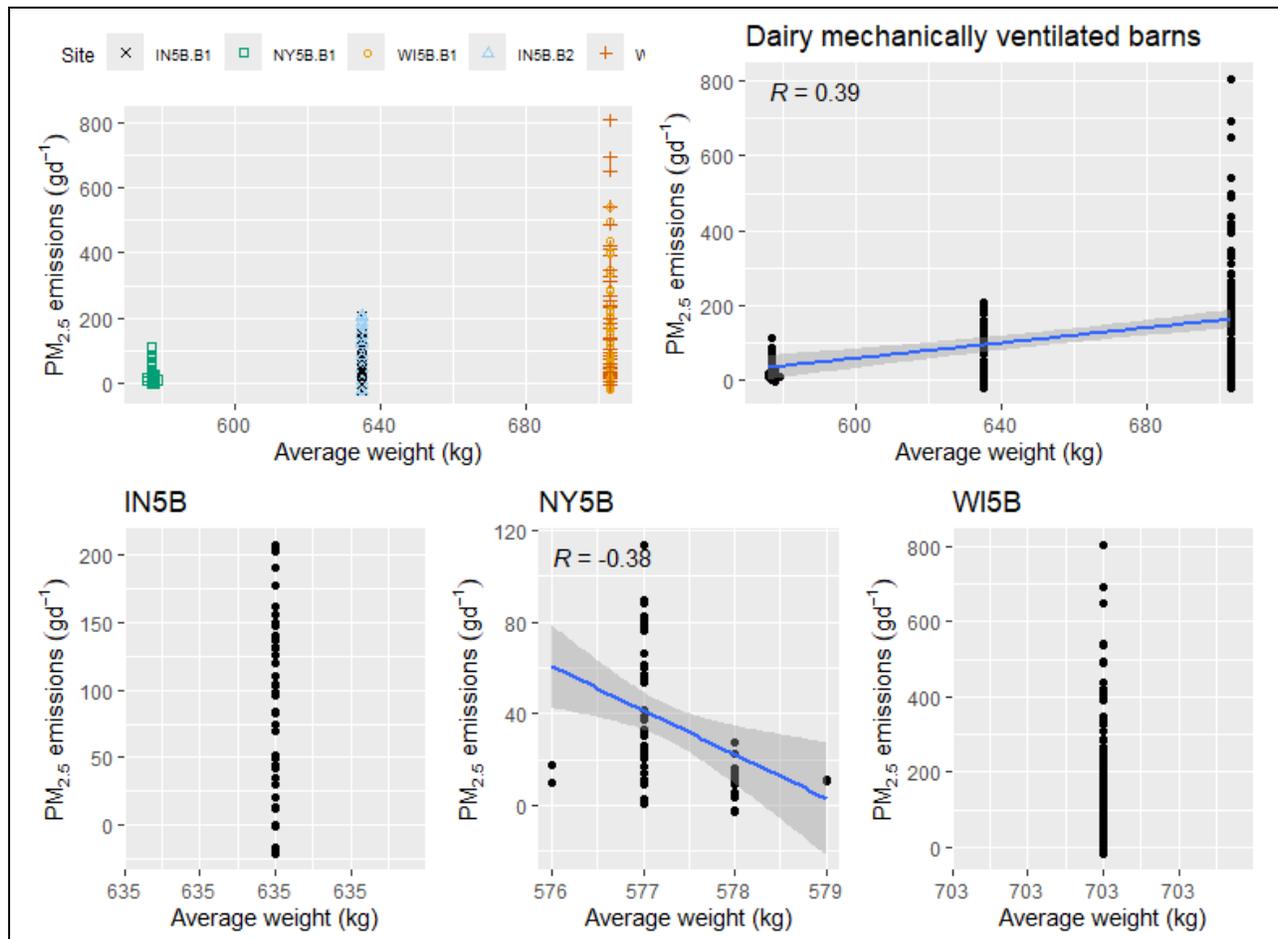


Figure 1.39: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus average animal weight.

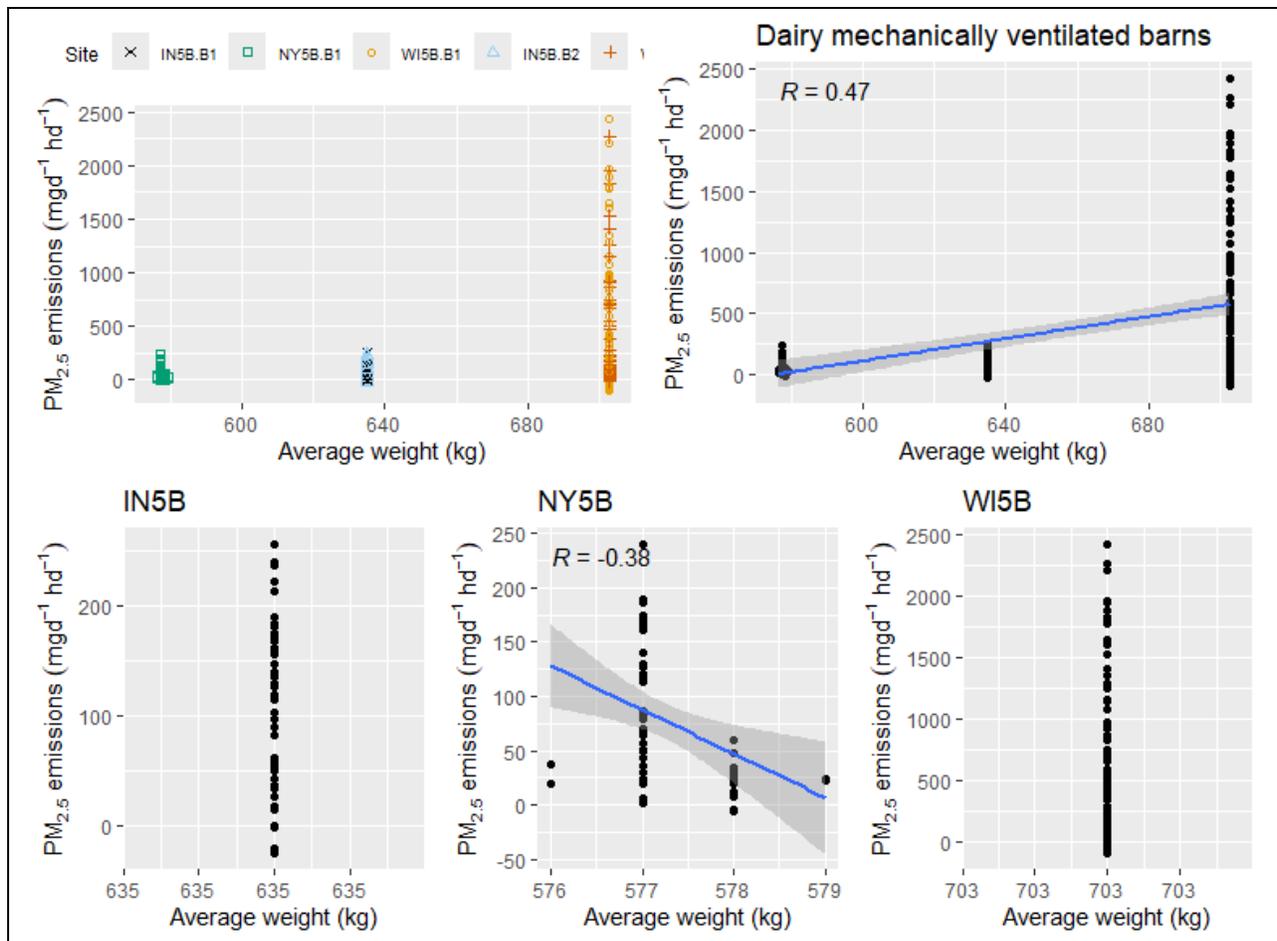


Figure 1.40: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus average animal weight.

1.1.3.3 Live animal weight

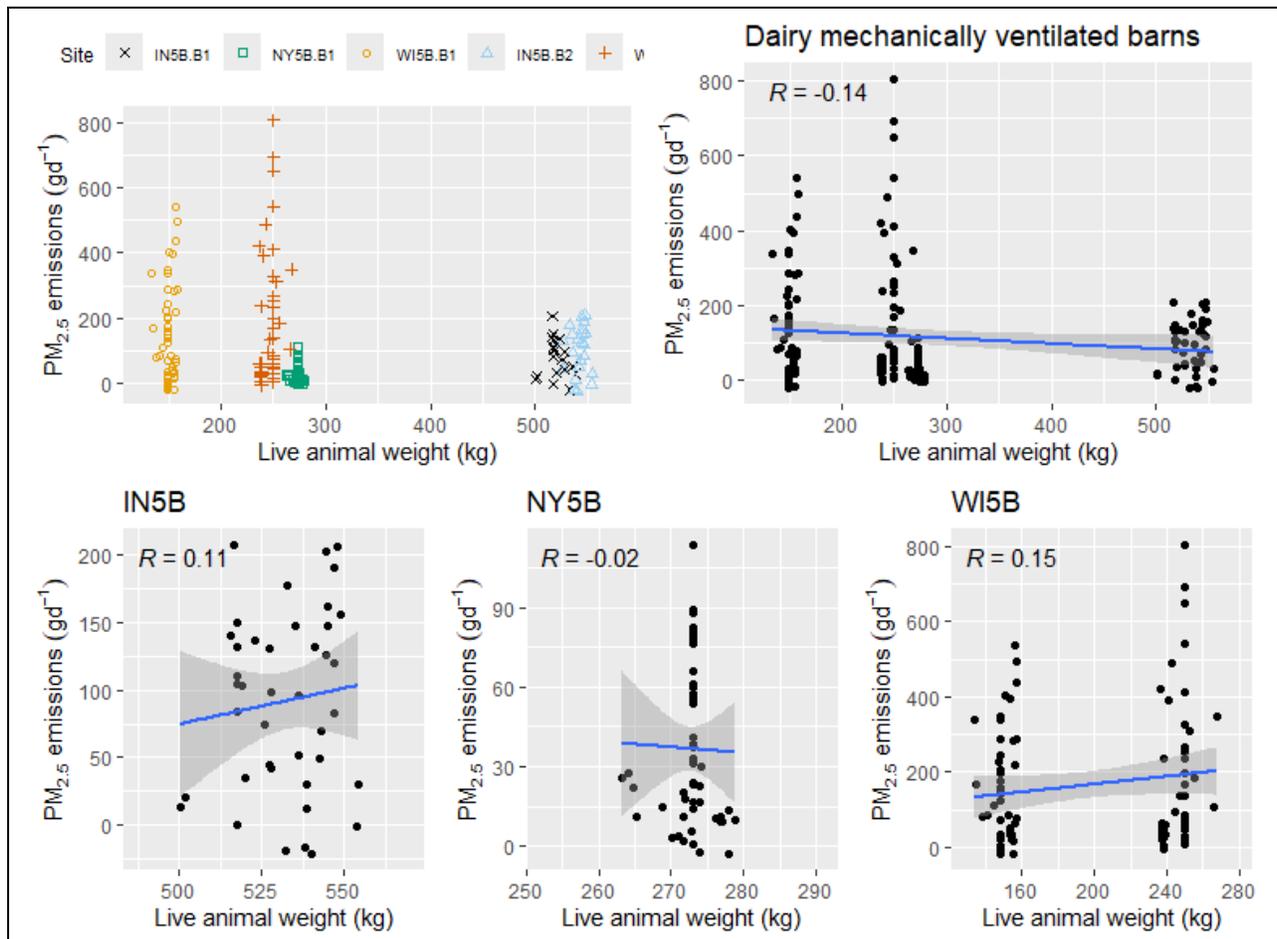


Figure 1.41: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus live animal weight.

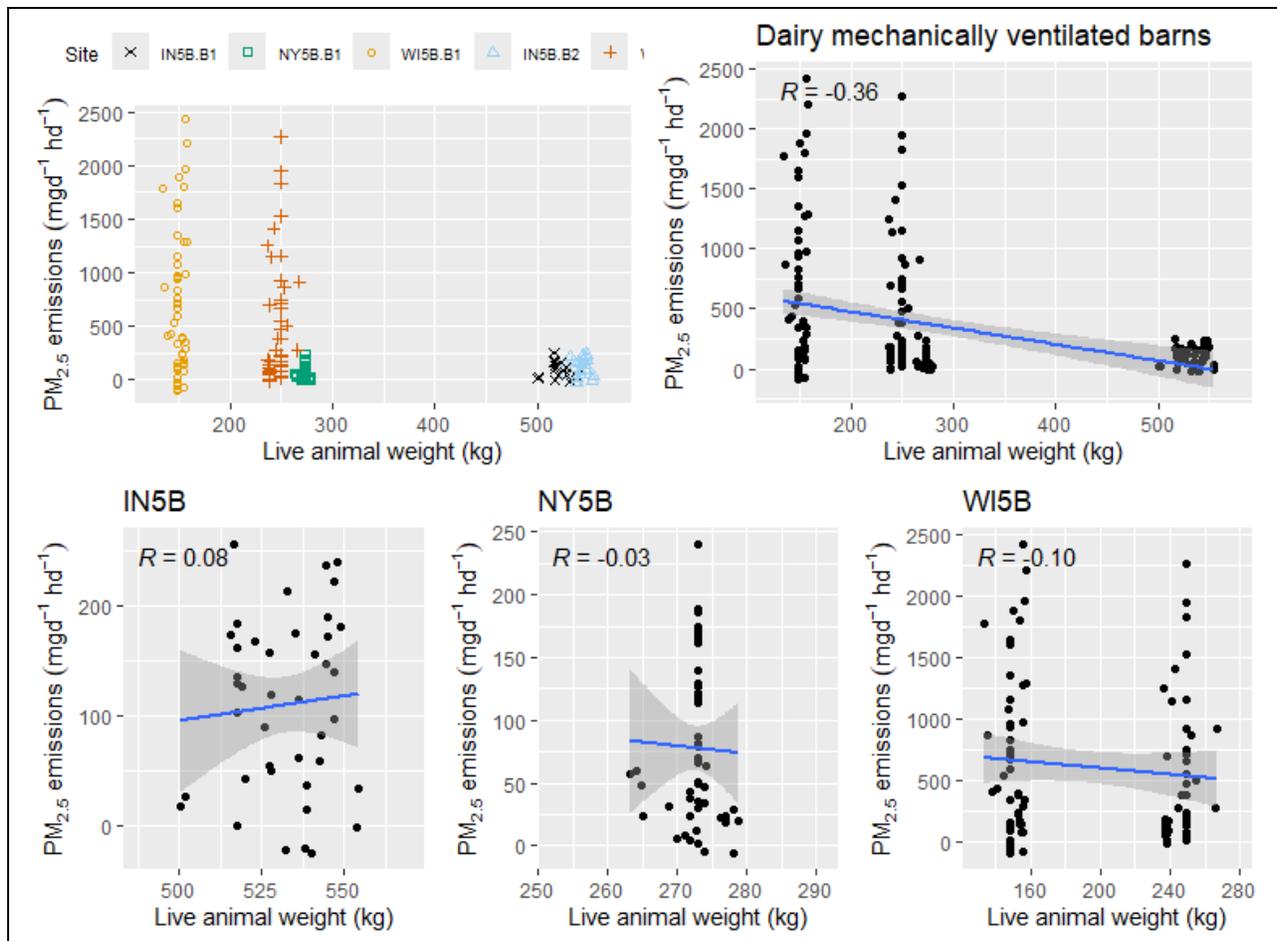


Figure 1.42: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus live animal weight.

1.1.3.4 Exhaust temperature

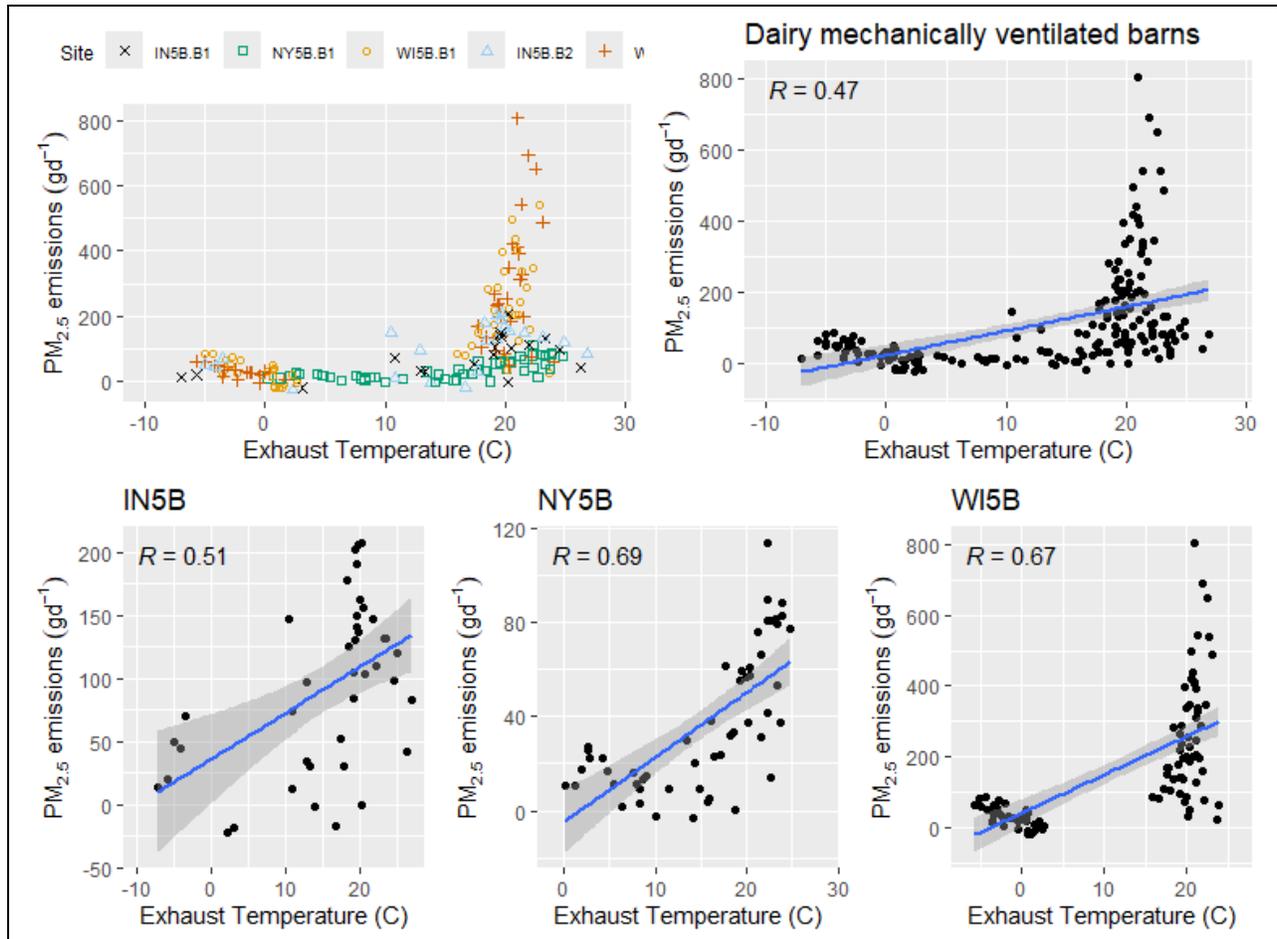


Figure 1.43: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus exhaust temperature.

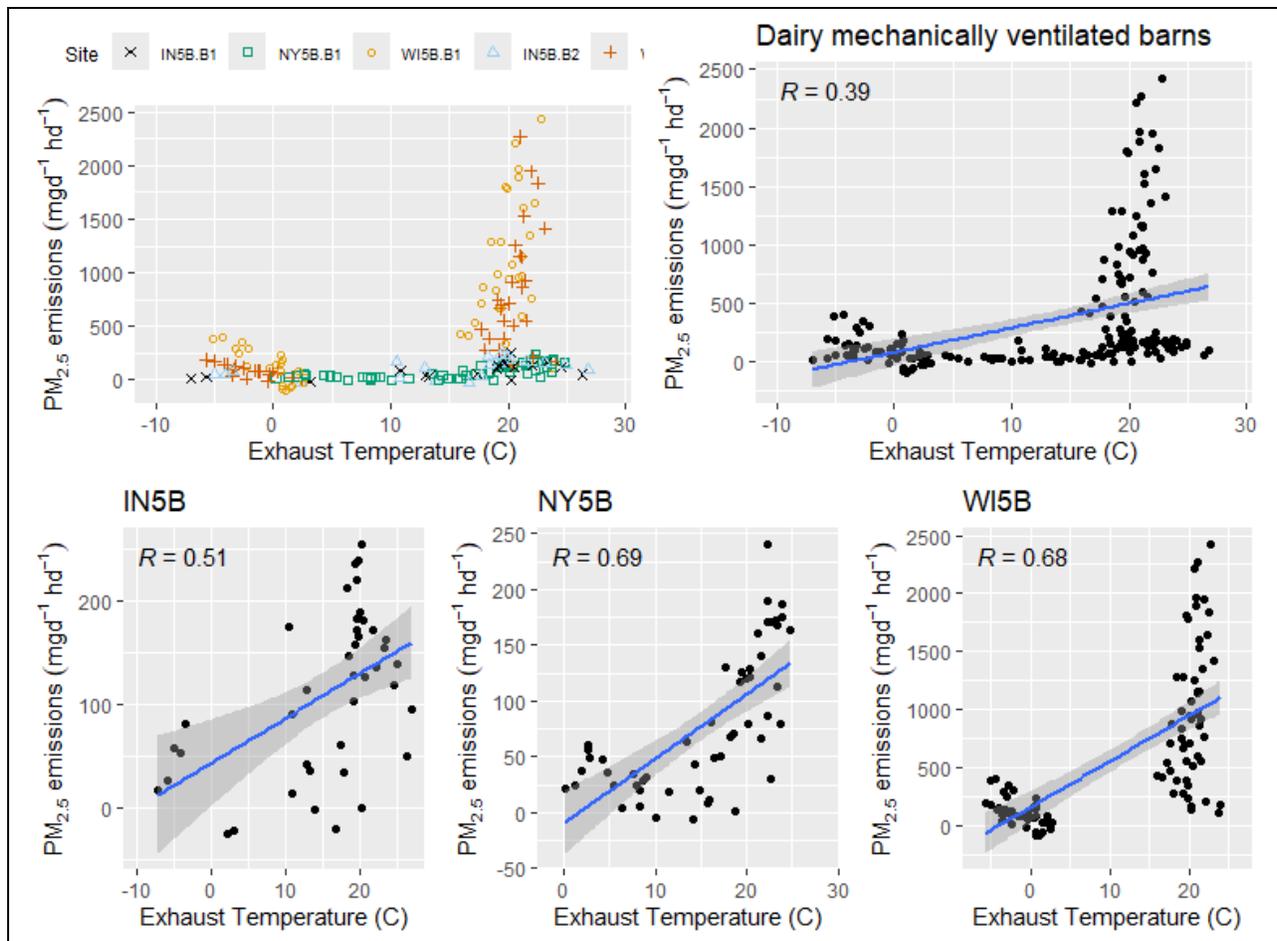


Figure 1.44: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

1.1.3.5 Exhaust relative humidity

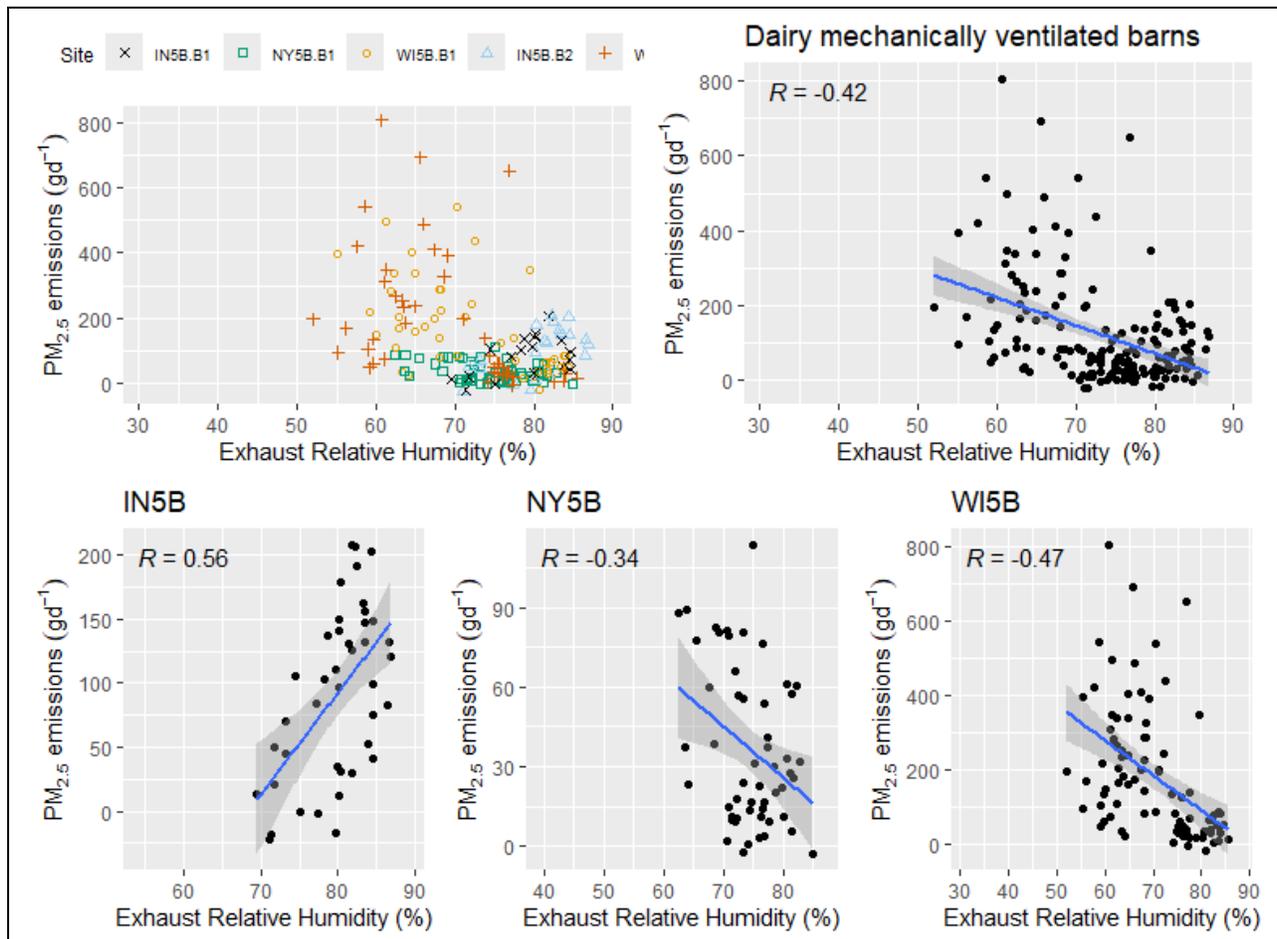


Figure 1.45: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus exhaust relative humidity.

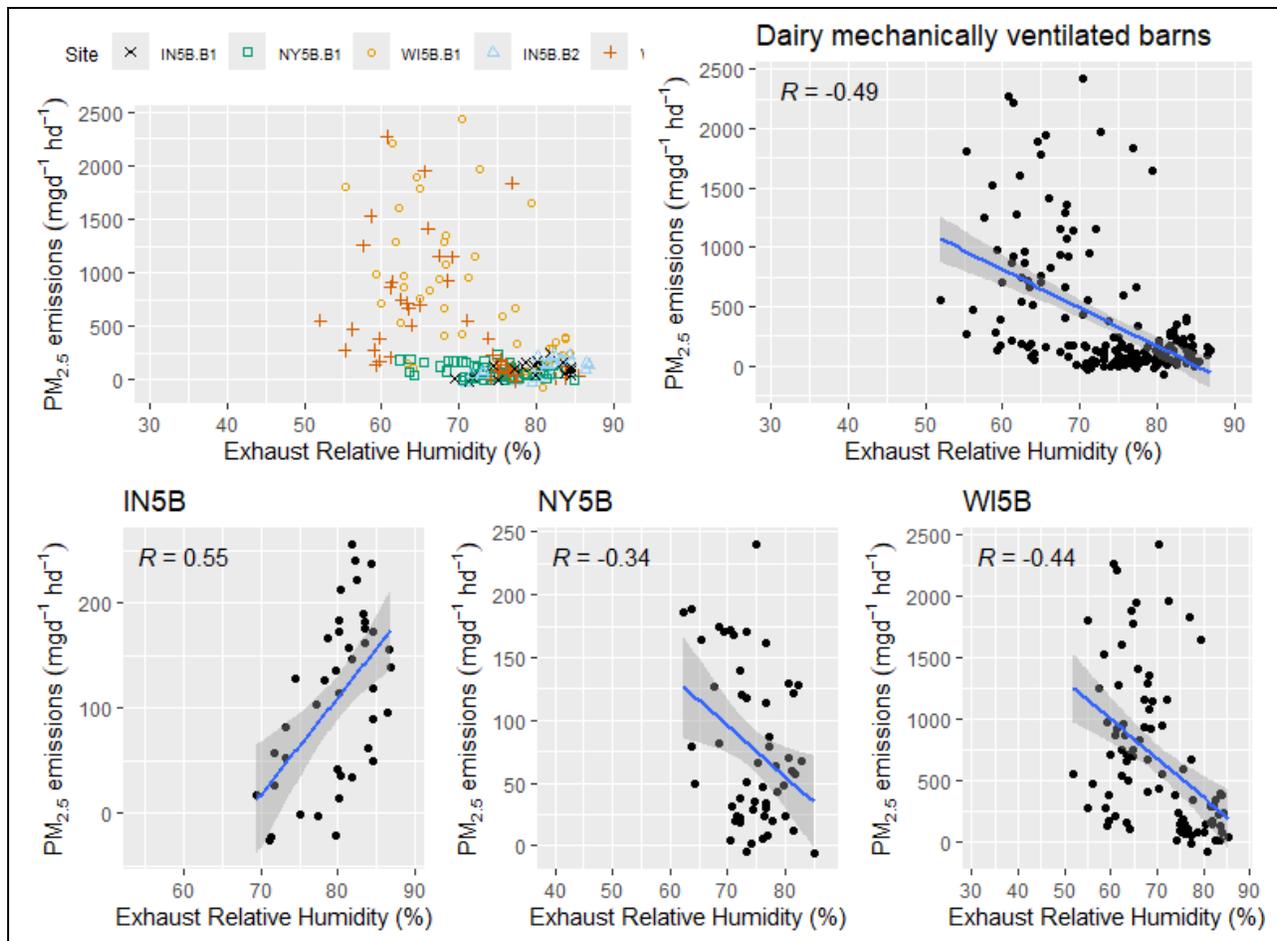


Figure 1.46: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

1.1.3.6 Airflow

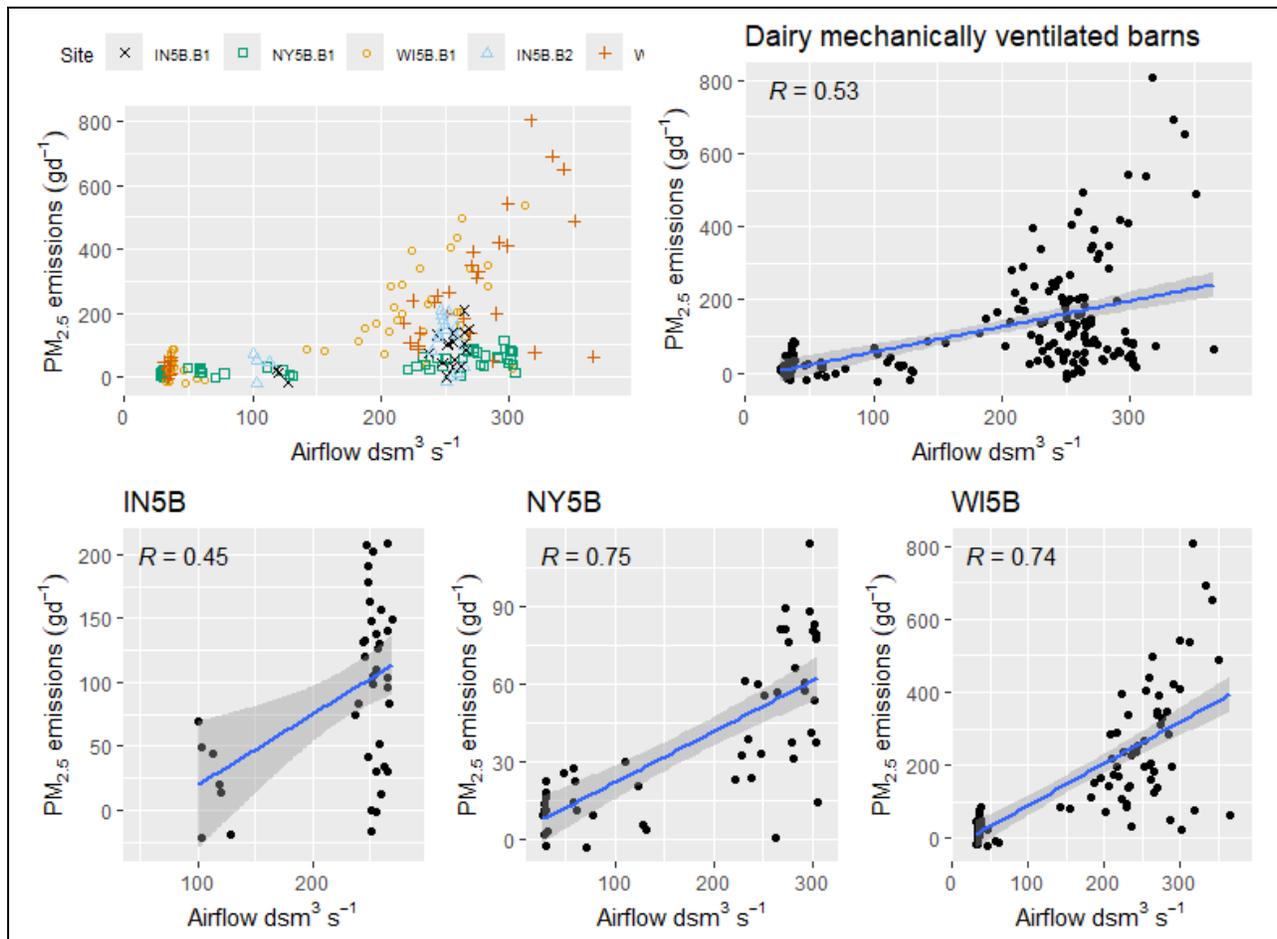


Figure 1.47: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus airflow.

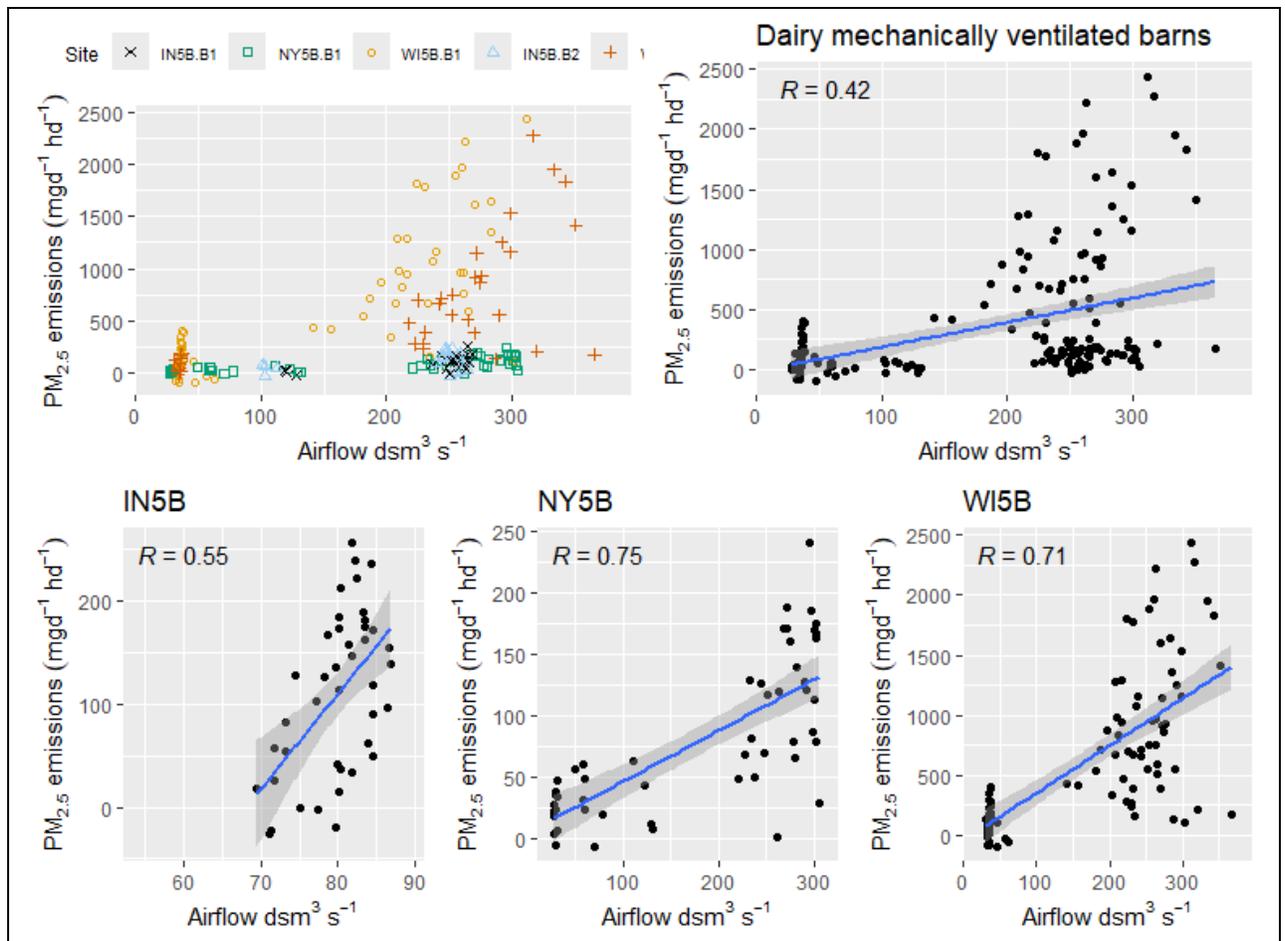


Figure 1.48: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus airflow.

1.1.4 Total Suspended Particulates (TSP)

1.1.4.1 Inventory

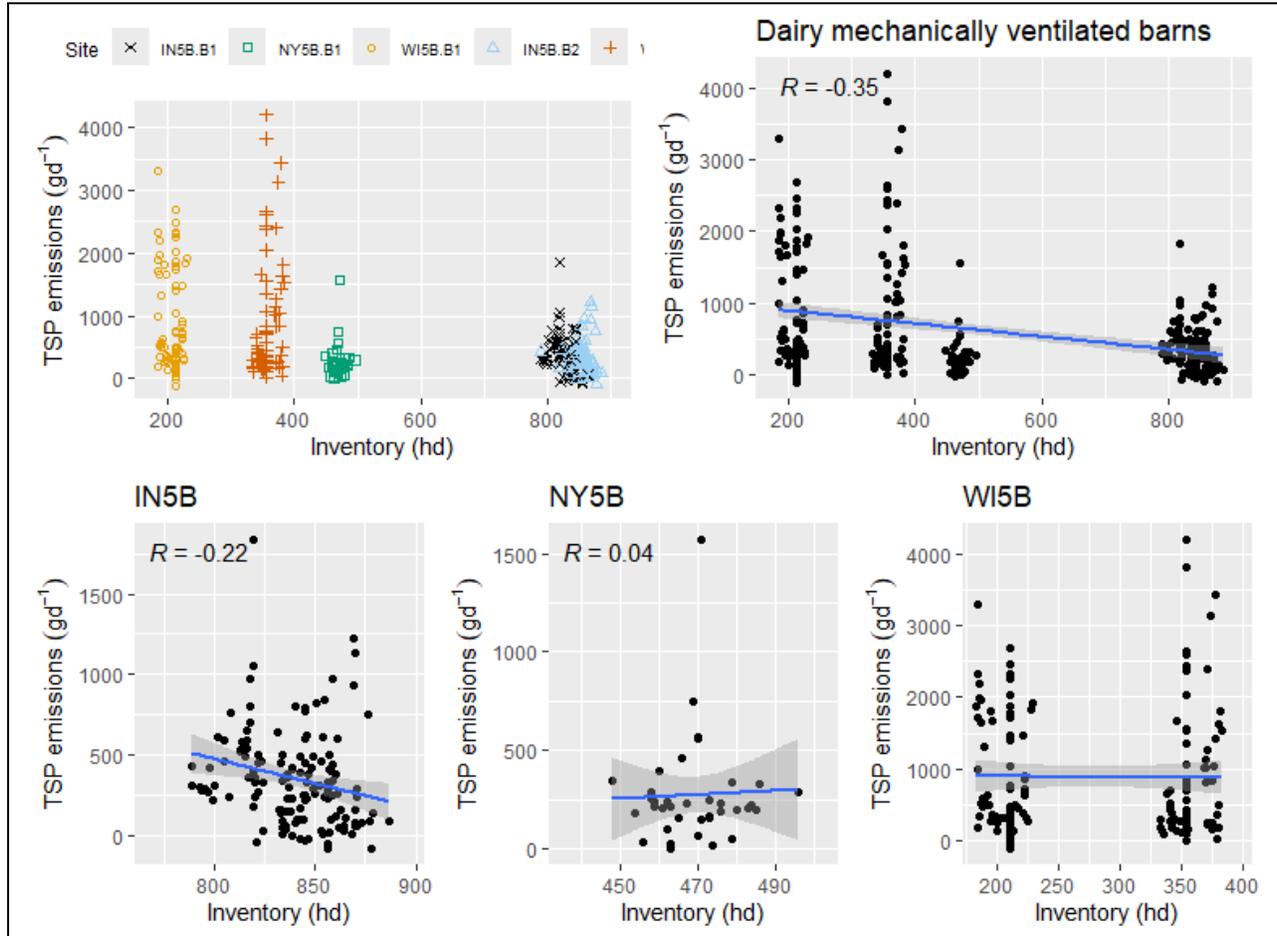


Figure 1.49: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d^{-1}) versus Inventory.

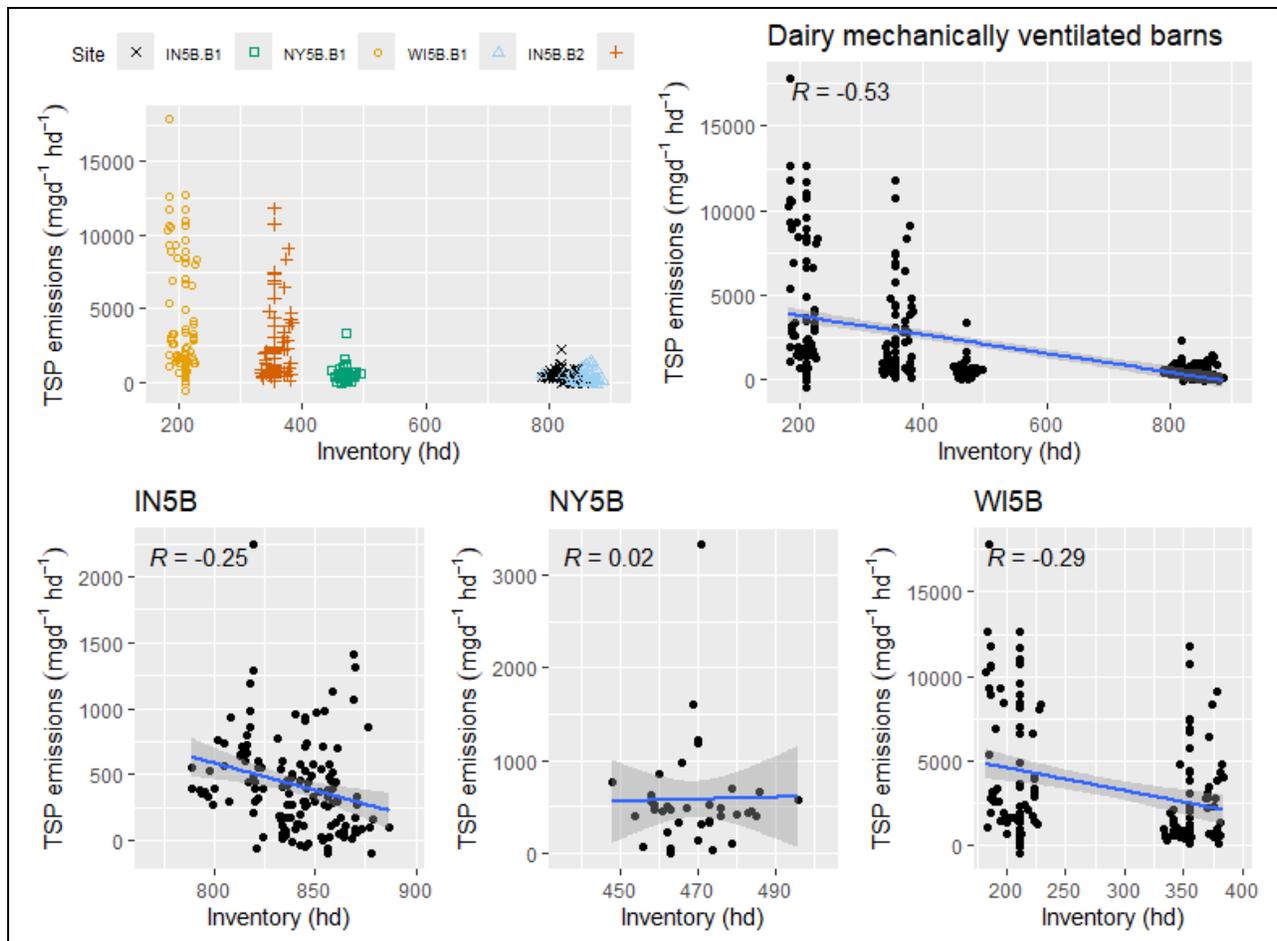


Figure 1.50: Scatter plot of dairy mechanically ventilated barns TSP emissions (mg d⁻¹hd⁻¹) versus Inventory.

1.1.4.2 Average animal weight

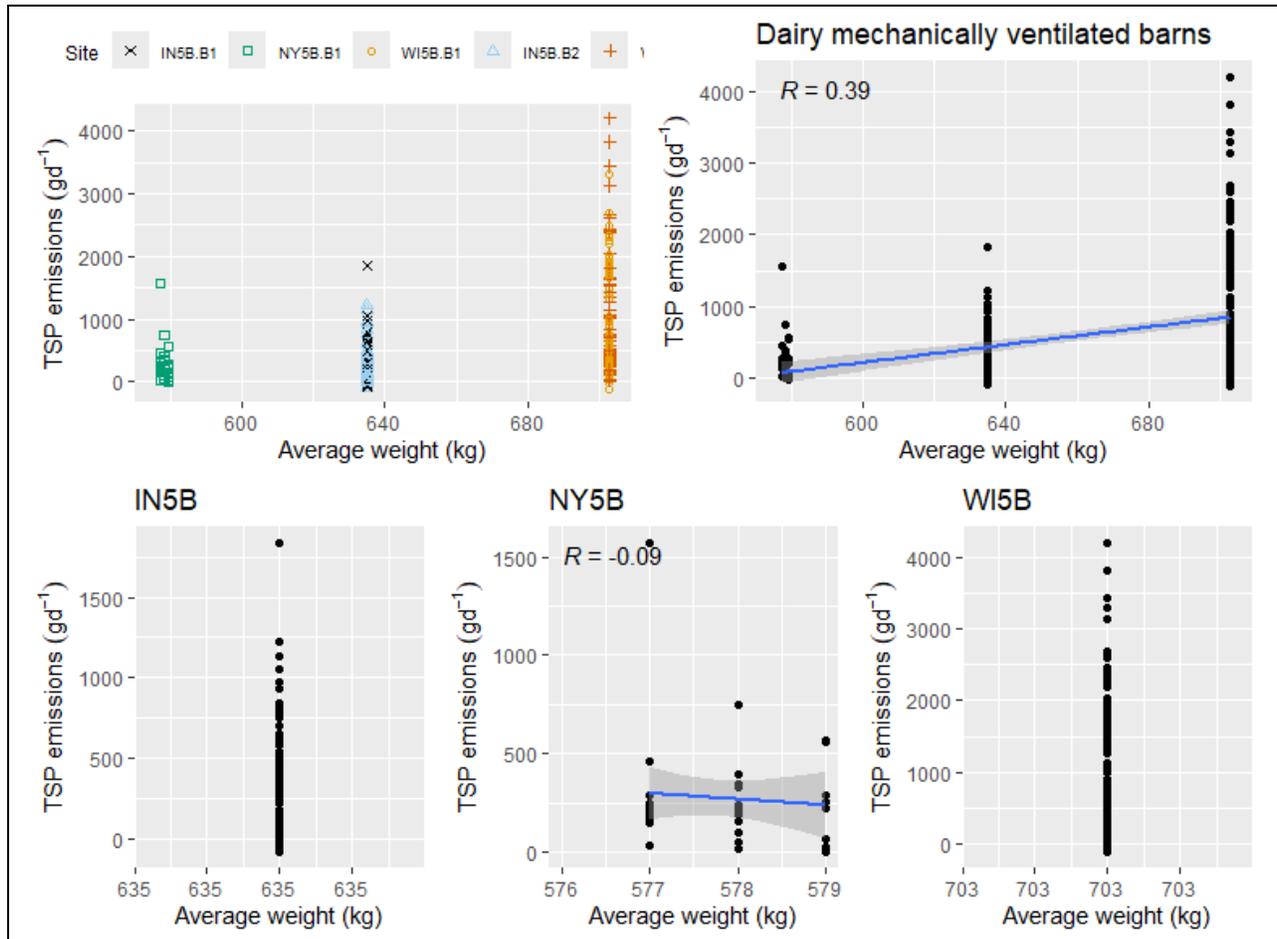


Figure 1.51: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d⁻¹) versus average animal weight.

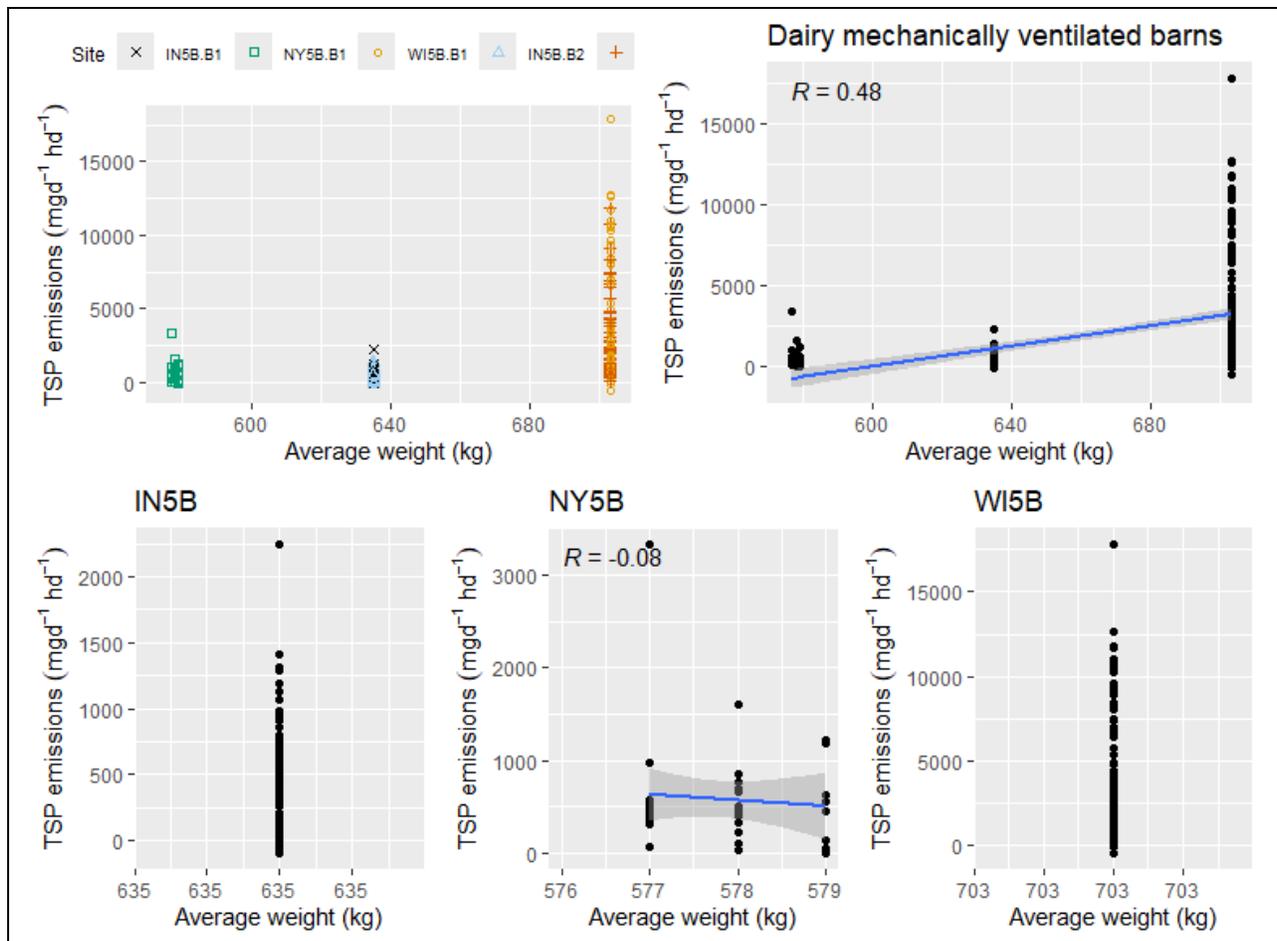


Figure 1.52: Scatter plot of dairy mechanically ventilated barns TSP emissions (mg d⁻¹hd⁻¹) versus average animal weight.

1.1.4.3 Live animal weight

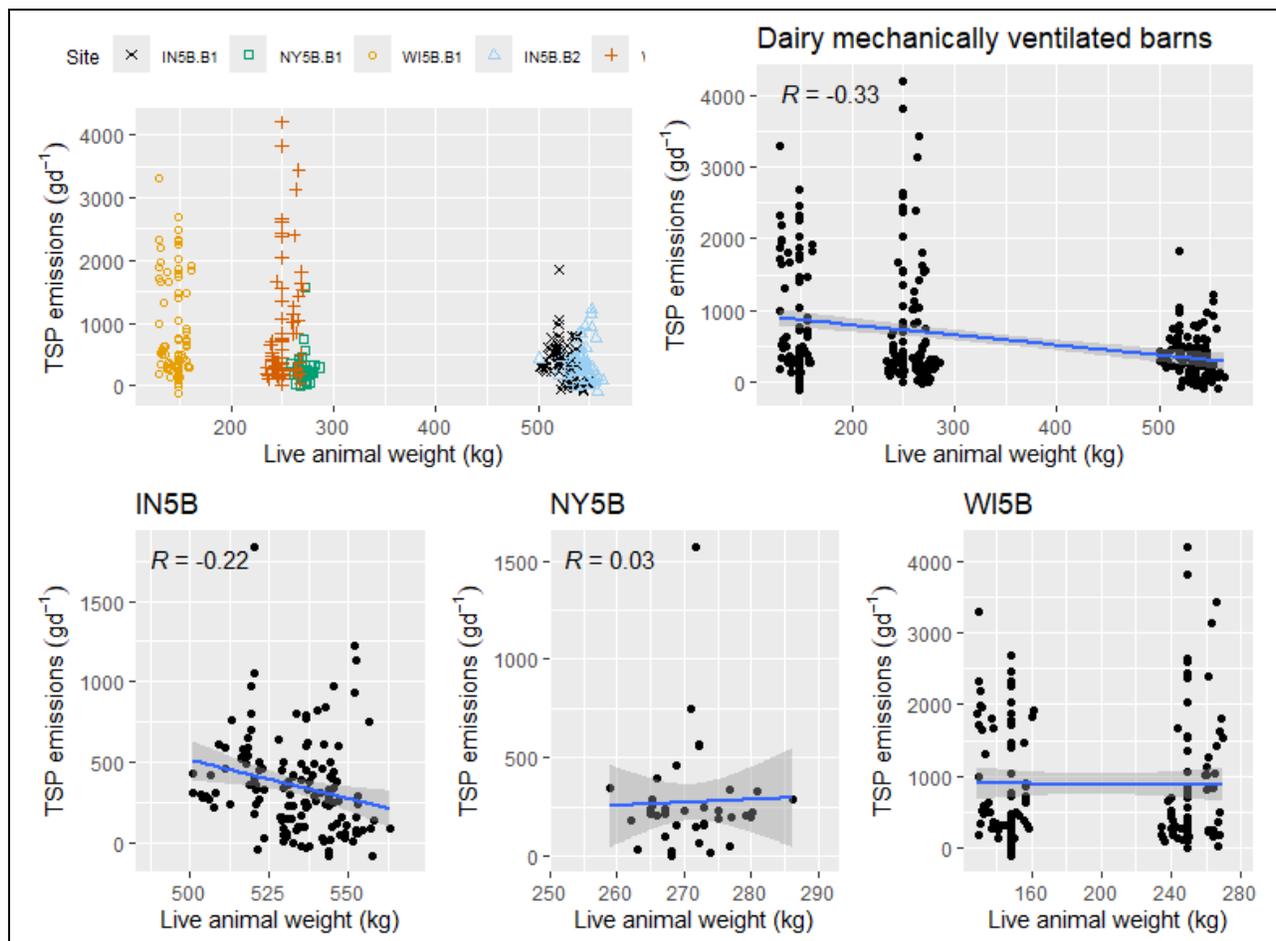


Figure 1.53: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d^{-1}) versus live animal weight.

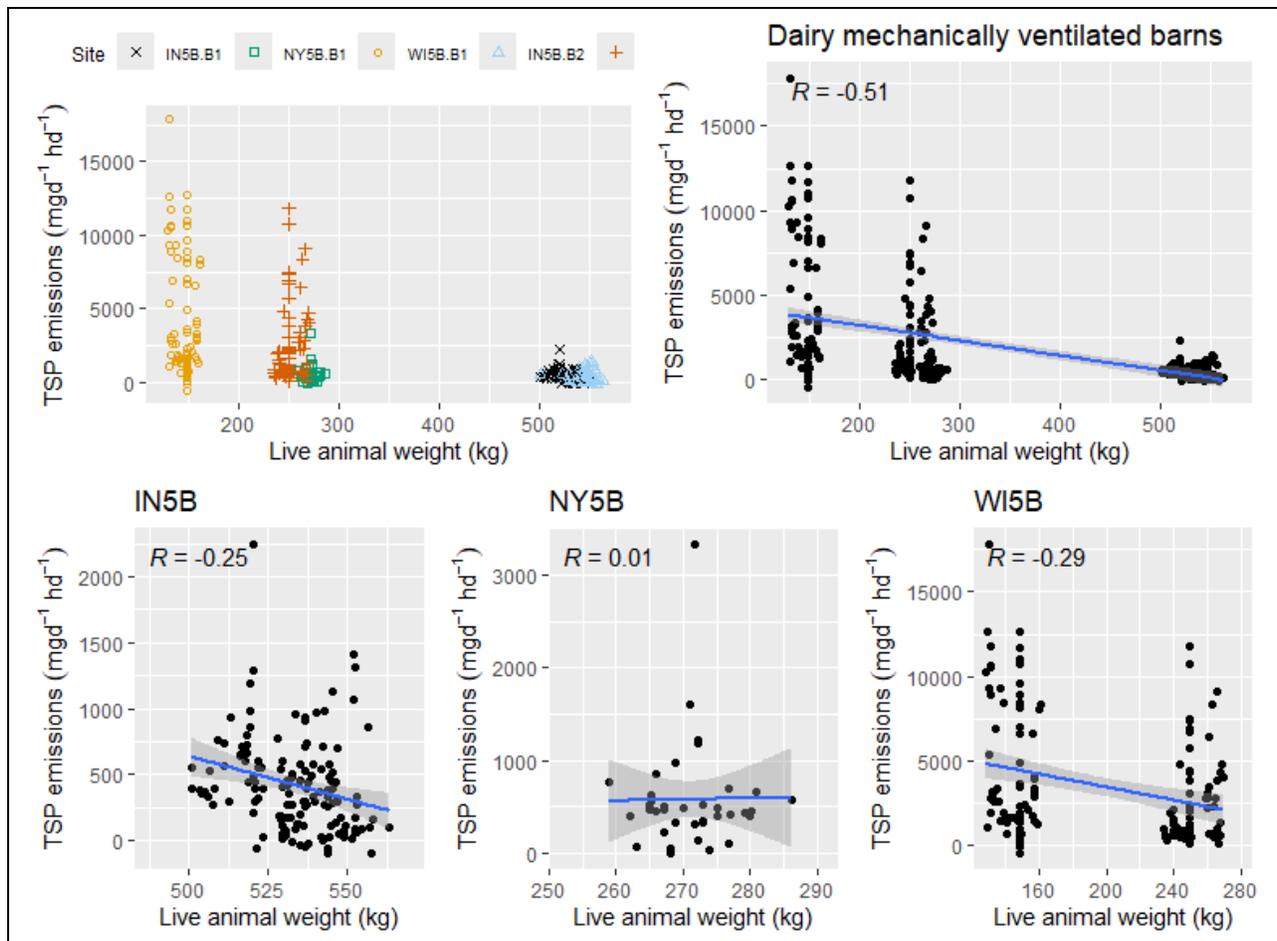


Figure 1.54: Scatter plot of dairy mechanically ventilated barns TSP emissions (mg d⁻¹hd⁻¹) versus live animal weight.

1.1.4.4 Exhaust temperature

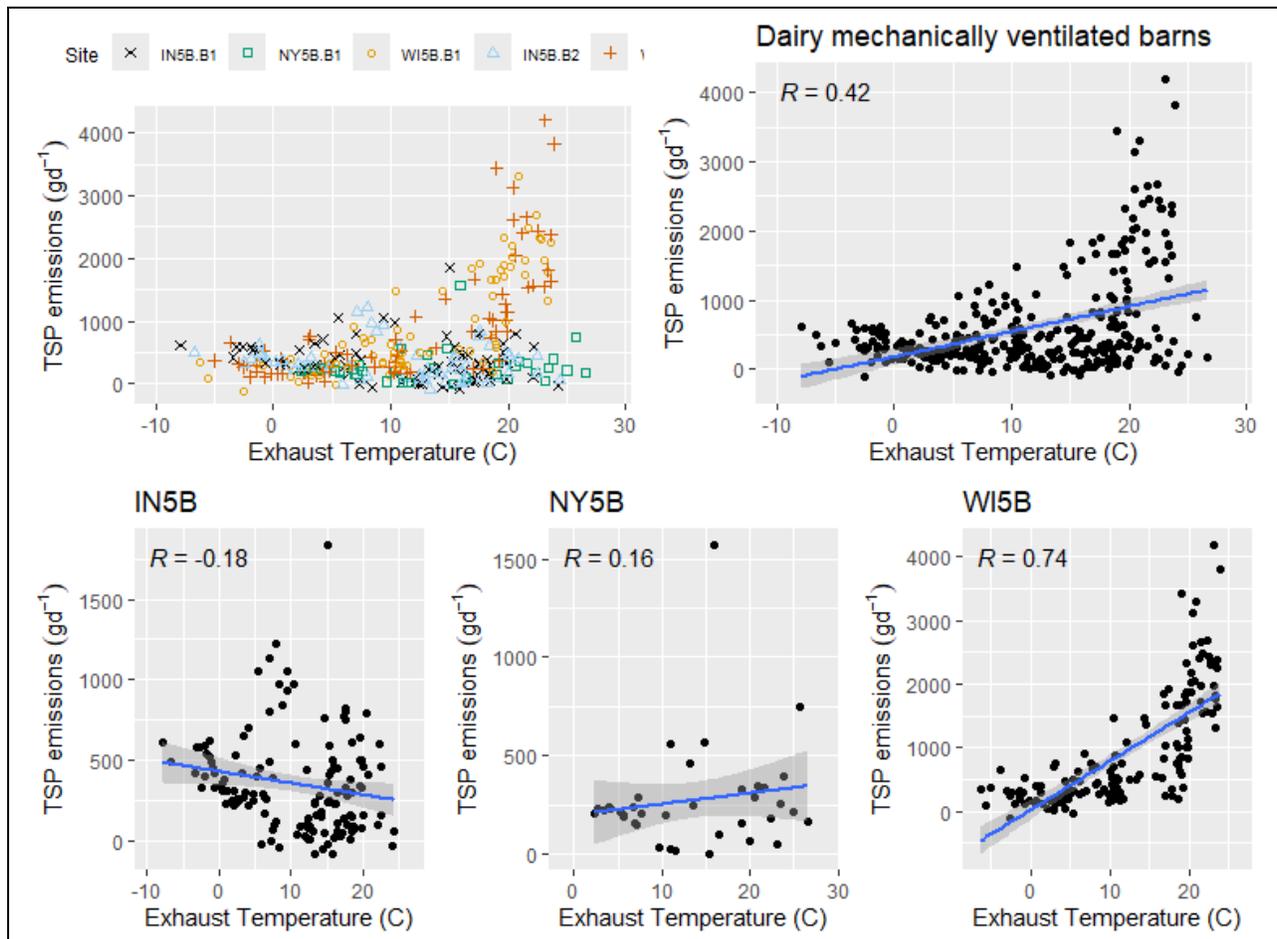


Figure 1.55: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d^{-1}) versus exhaust temperature.

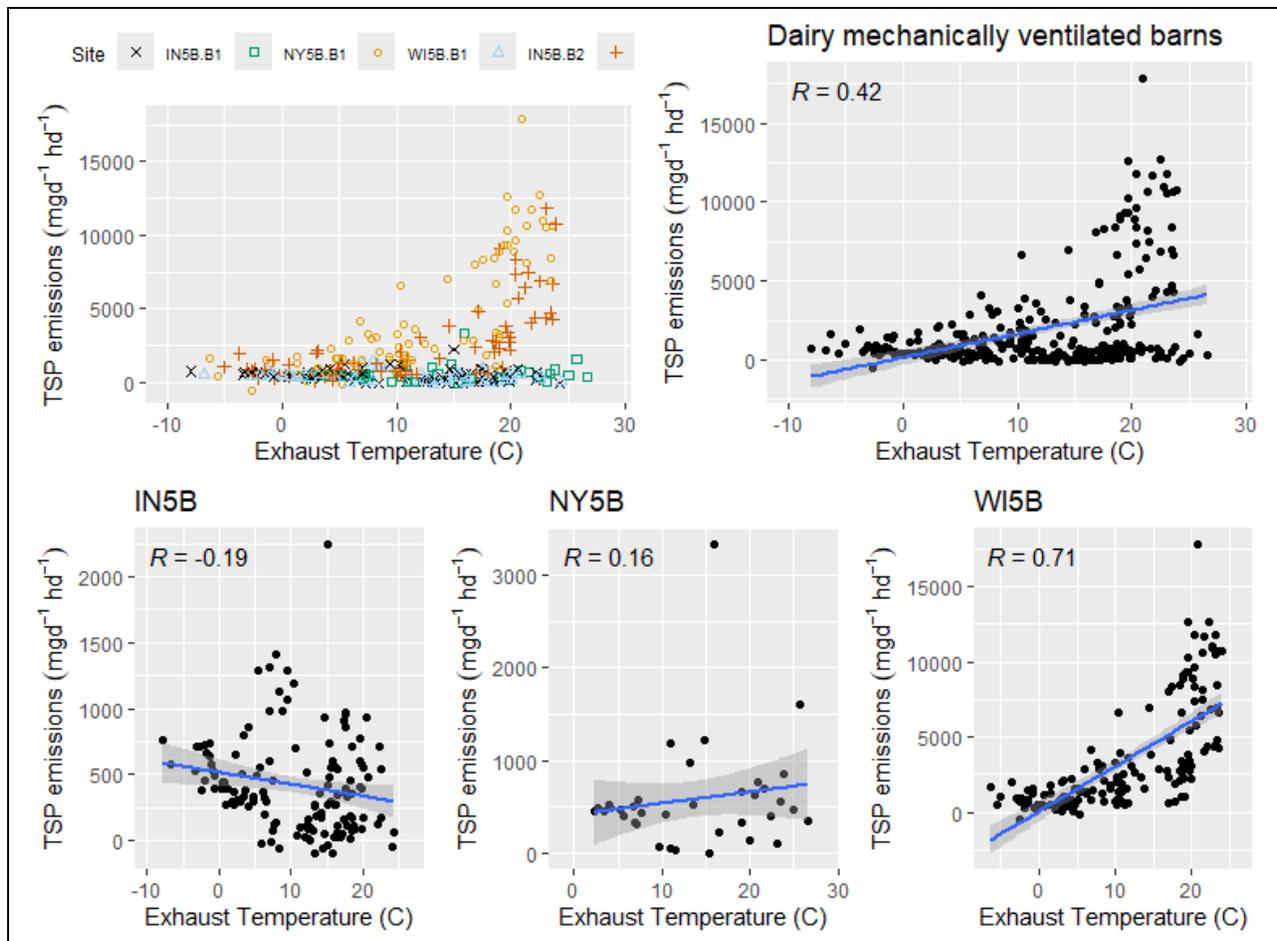


Figure 1.56: Scatter plot of dairy mechanically ventilated barns TSP emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

1.1.4.5 Exhaust relative humidity

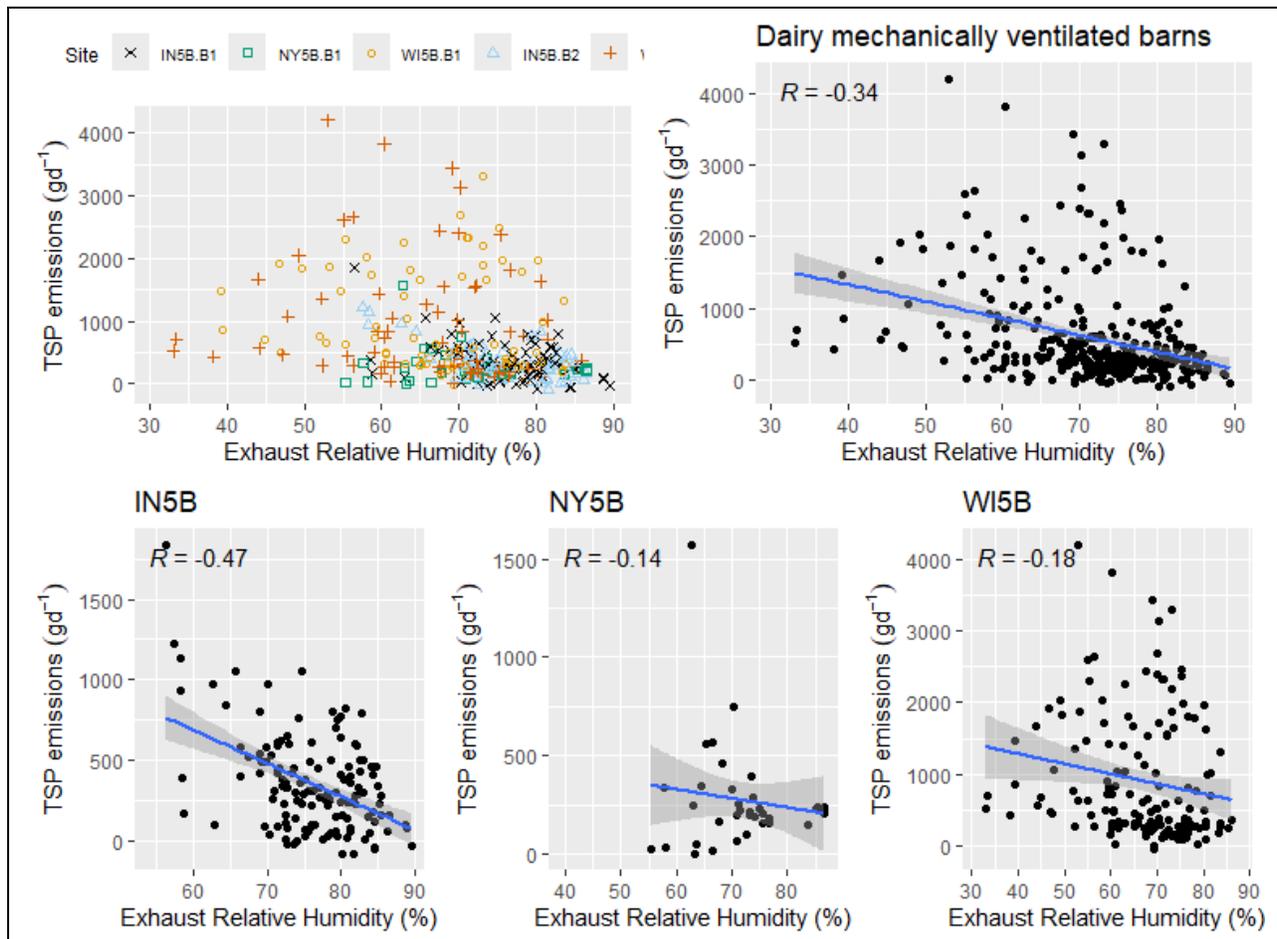


Figure 1.57: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d⁻¹) versus exhaust relative humidity.

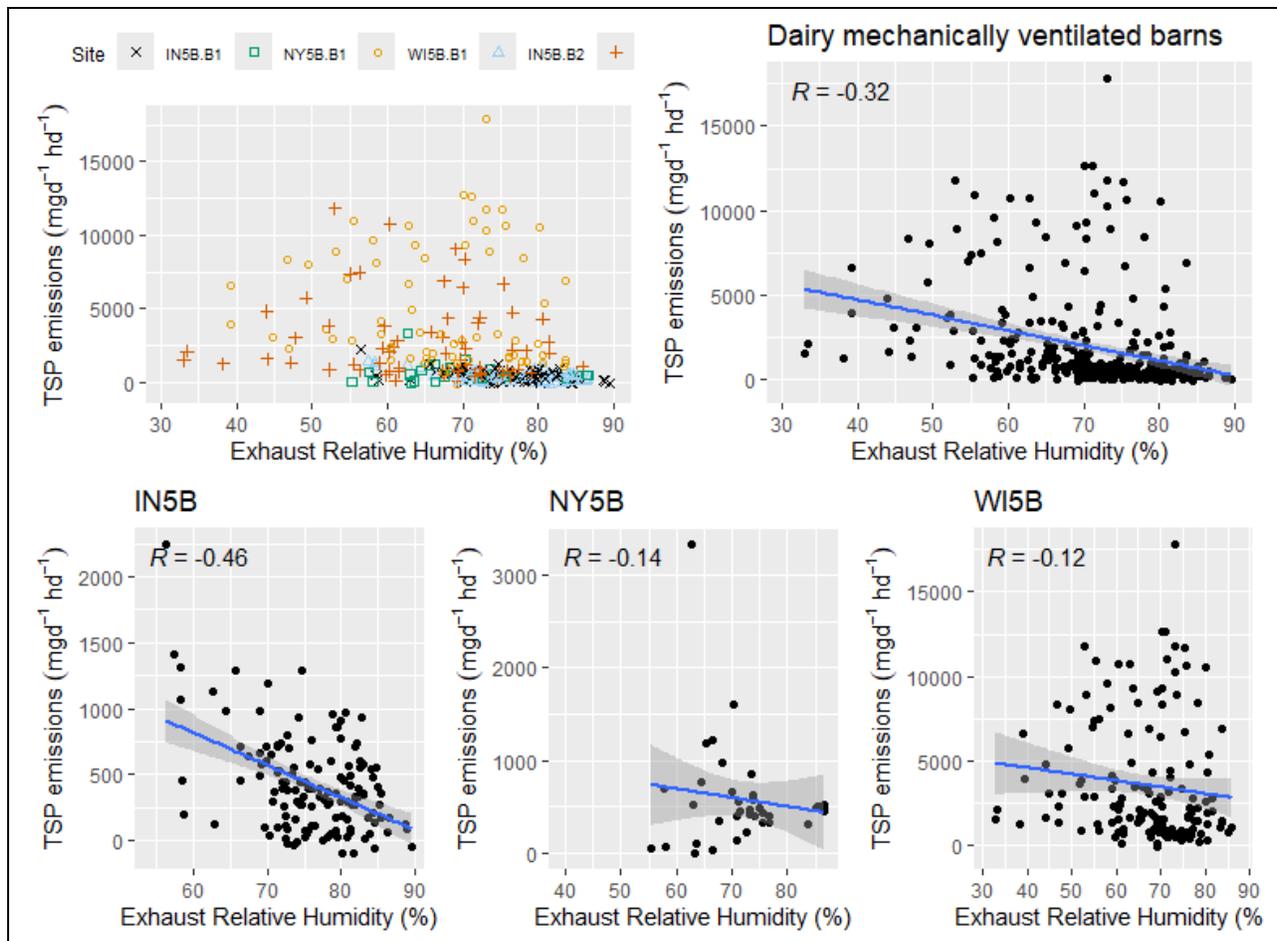


Figure 1.58: Scatter plot of dairy mechanically ventilated barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus exhaust relative humidity.

1.1.4.6 Airflow

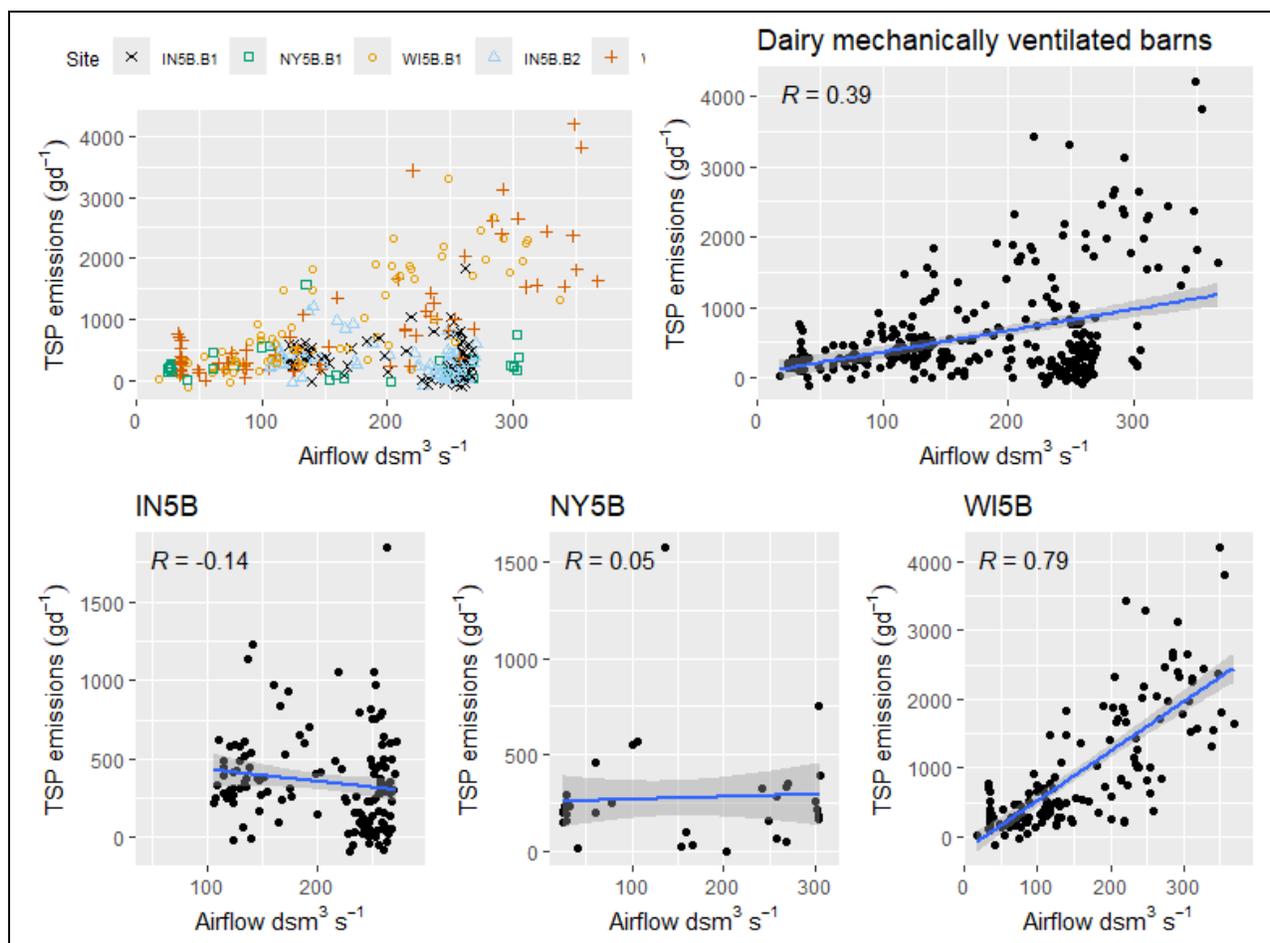


Figure 1.59: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d⁻¹) versus airflow.

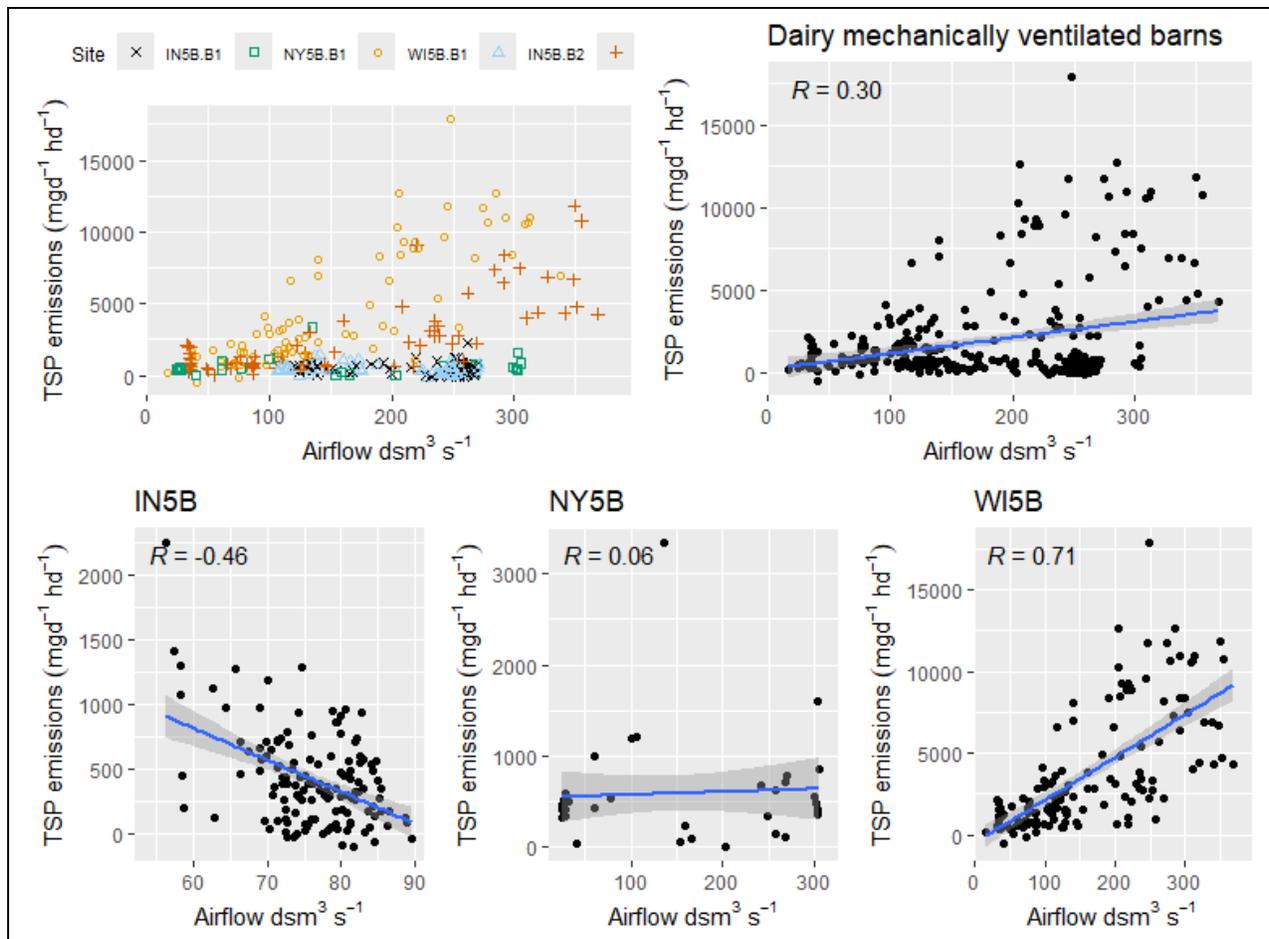


Figure 1.60: Scatter plot of dairy mechanically ventilated barns TSP emissions (mg d⁻¹hd⁻¹) versus airflow.

1.2 Ambient

Table 1.2: Summary of dairy mechanically ventilated barns R² values for ambient parameters.

Emission	Parameter	R	R ²	Strength
NH ₃ (kgd ⁻¹)	Ambient Temperature (C)	0.54	0.29	modest
H ₂ S (gd ⁻¹)	Ambient Temperature (C)	0.26	0.07	slight or weak
PM ₁₀ (gd ⁻¹)	Ambient Temperature (C)	0.46	0.22	modest
PM _{2.5} (gd ⁻¹)	Ambient Temperature (C)	0.43	0.19	slight or weak
TSP (gd ⁻¹)	Ambient Temperature (C)	0.36	0.13	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.73	0.54	moderate
H ₂ S (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.03	0	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.42	0.18	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.29	0.08	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.36	0.13	slight or weak
NH ₃ (kgd ⁻¹)	Ambient Relative humidity (%)	-0.11	0.01	slight or weak
H ₂ S (gd ⁻¹)	Ambient Relative humidity (%)	0	0	slight or weak
PM ₁₀ (gd ⁻¹)	Ambient Relative humidity (%)	-0.14	0.02	slight or weak
PM _{2.5} (gd ⁻¹)	Ambient Relative humidity (%)	-0.37	0.14	slight or weak
TSP (gd ⁻¹)	Ambient Relative humidity (%)	-0.15	0.02	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.12	0.01	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	0.02	0	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.1	0.01	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.36	0.13	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.13	0.02	slight or weak

1.2.1 Ammonia (NH₃)

1.2.1.1 Ambient temperature

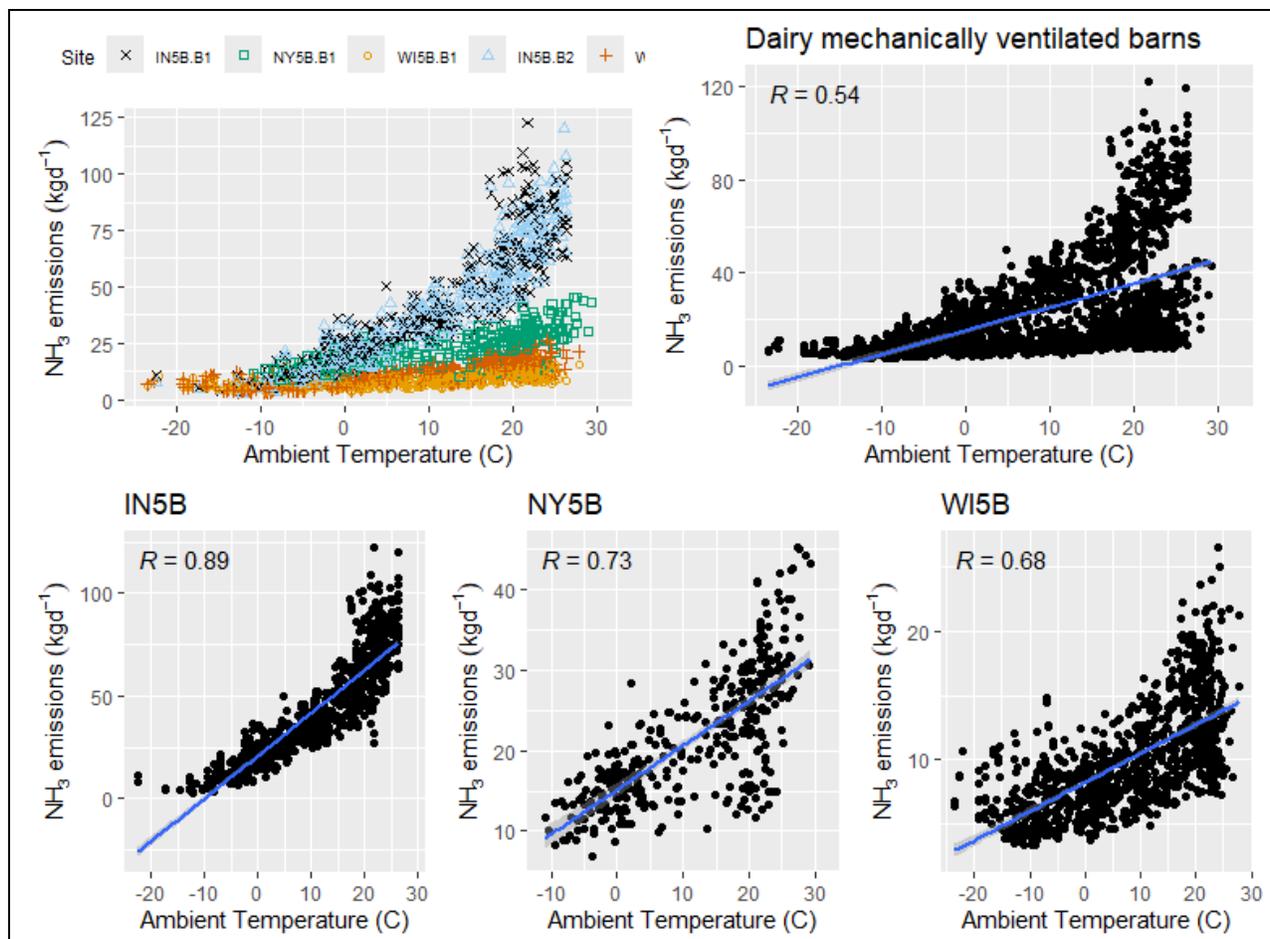


Figure 1.61: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus ambient temperature.

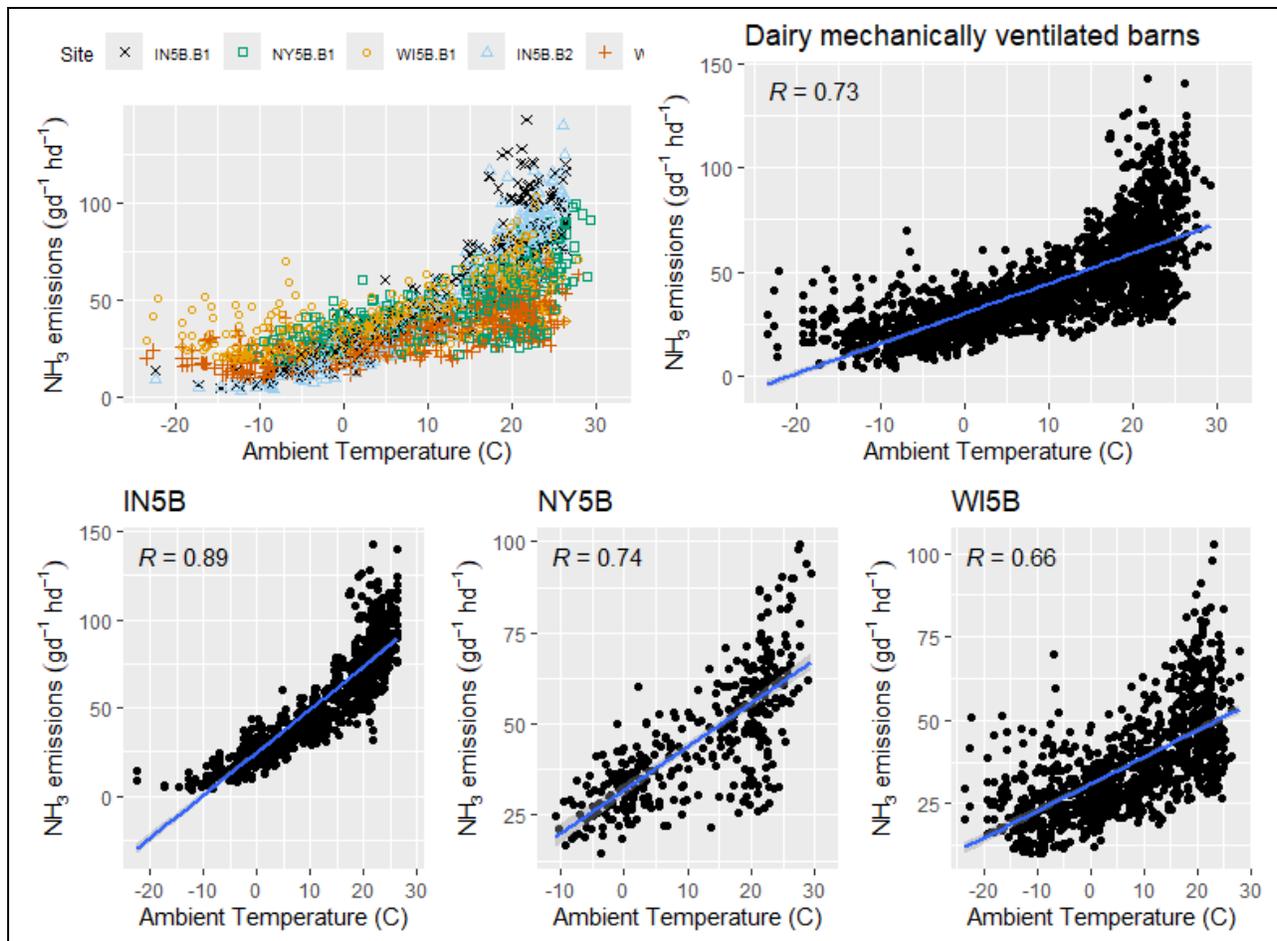


Figure 1.62: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus ambient temperature.

1.2.1.2 Ambient relative humidity

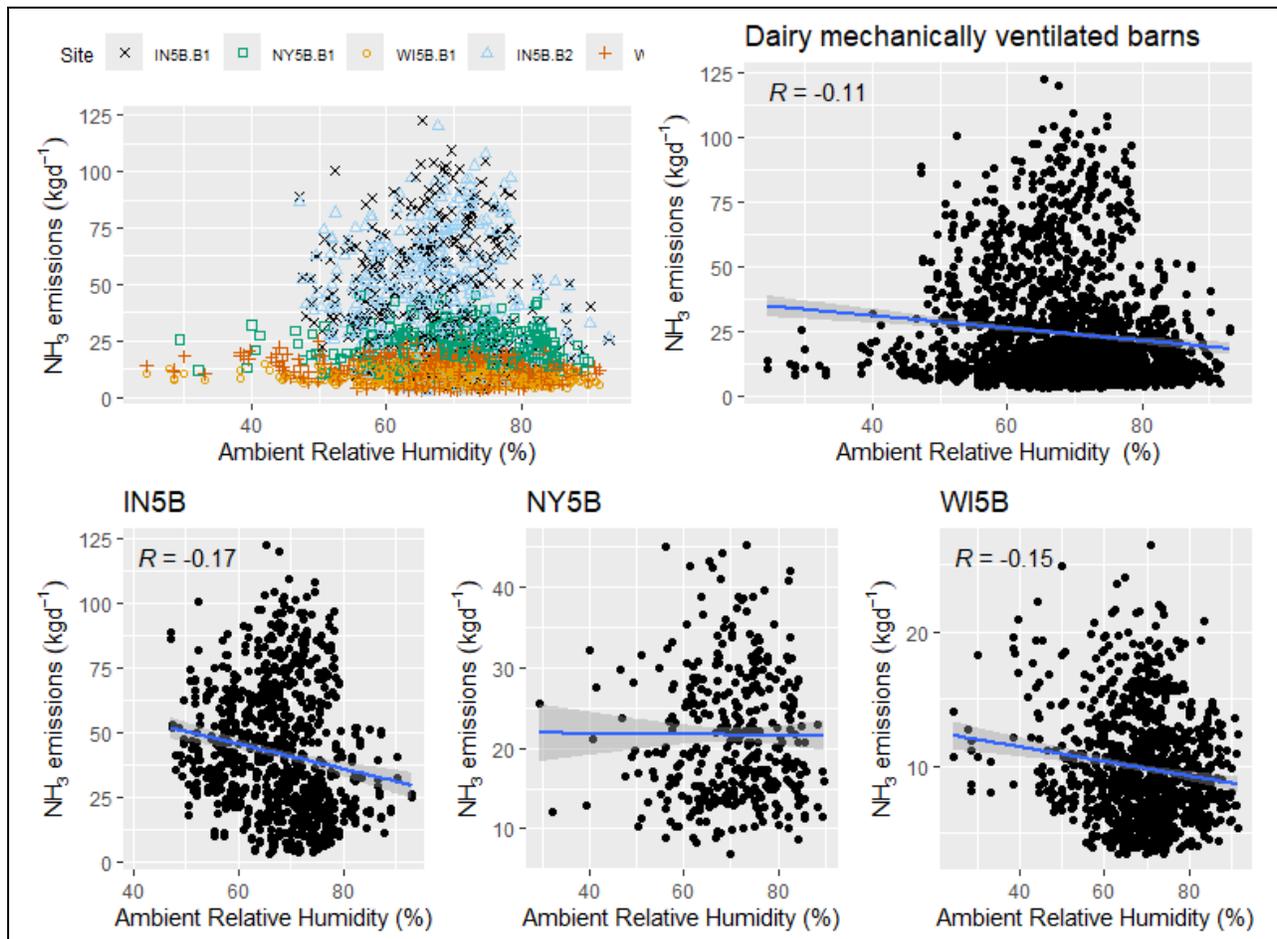


Figure 1.63: Scatter plot of dairy mechanically ventilated barns NH_3 emissions (kg d^{-1}) versus ambient relative humidity.

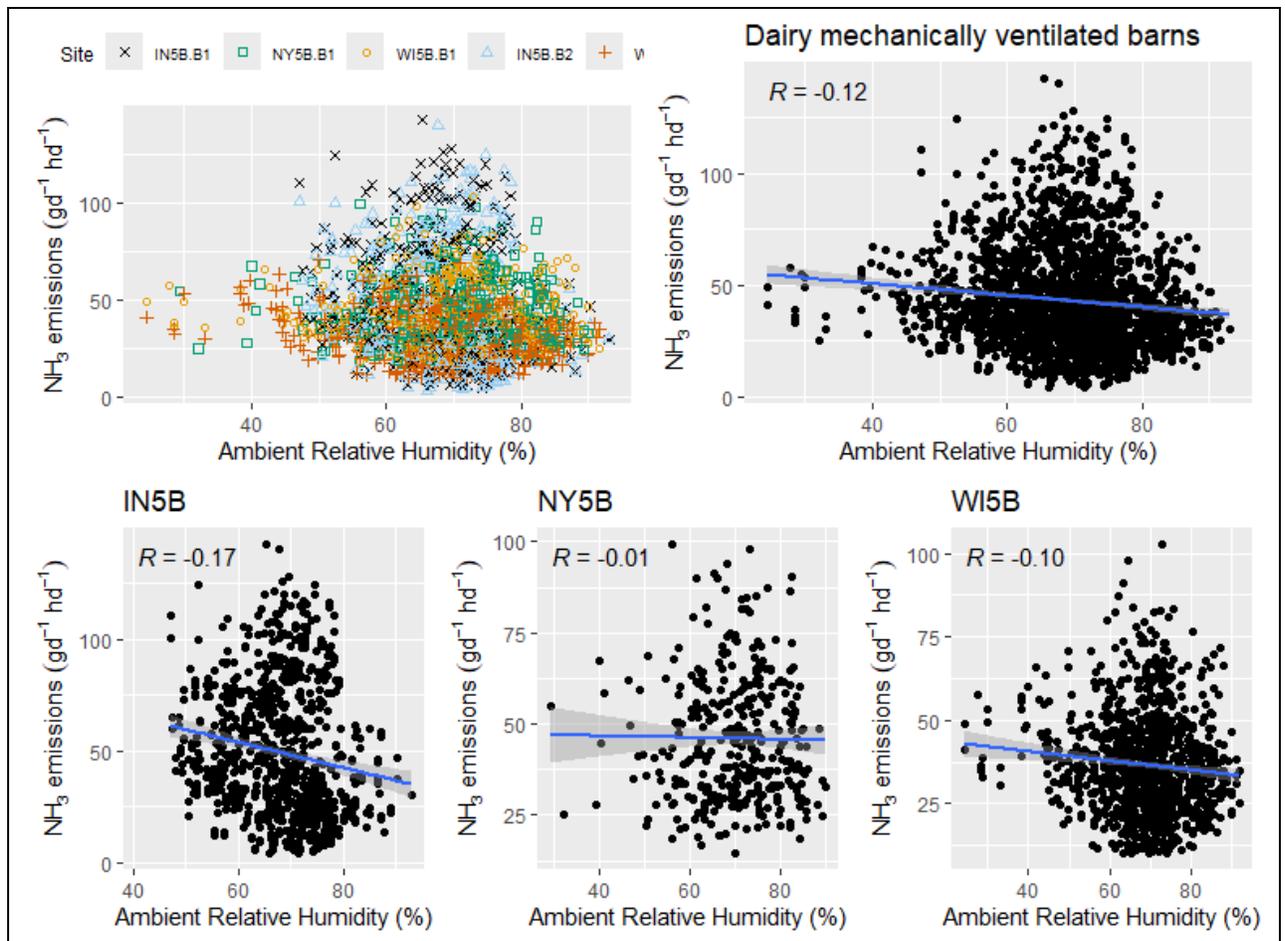


Figure 1.64: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus ambient relative humidity.

1.2.1.3 Air pressure

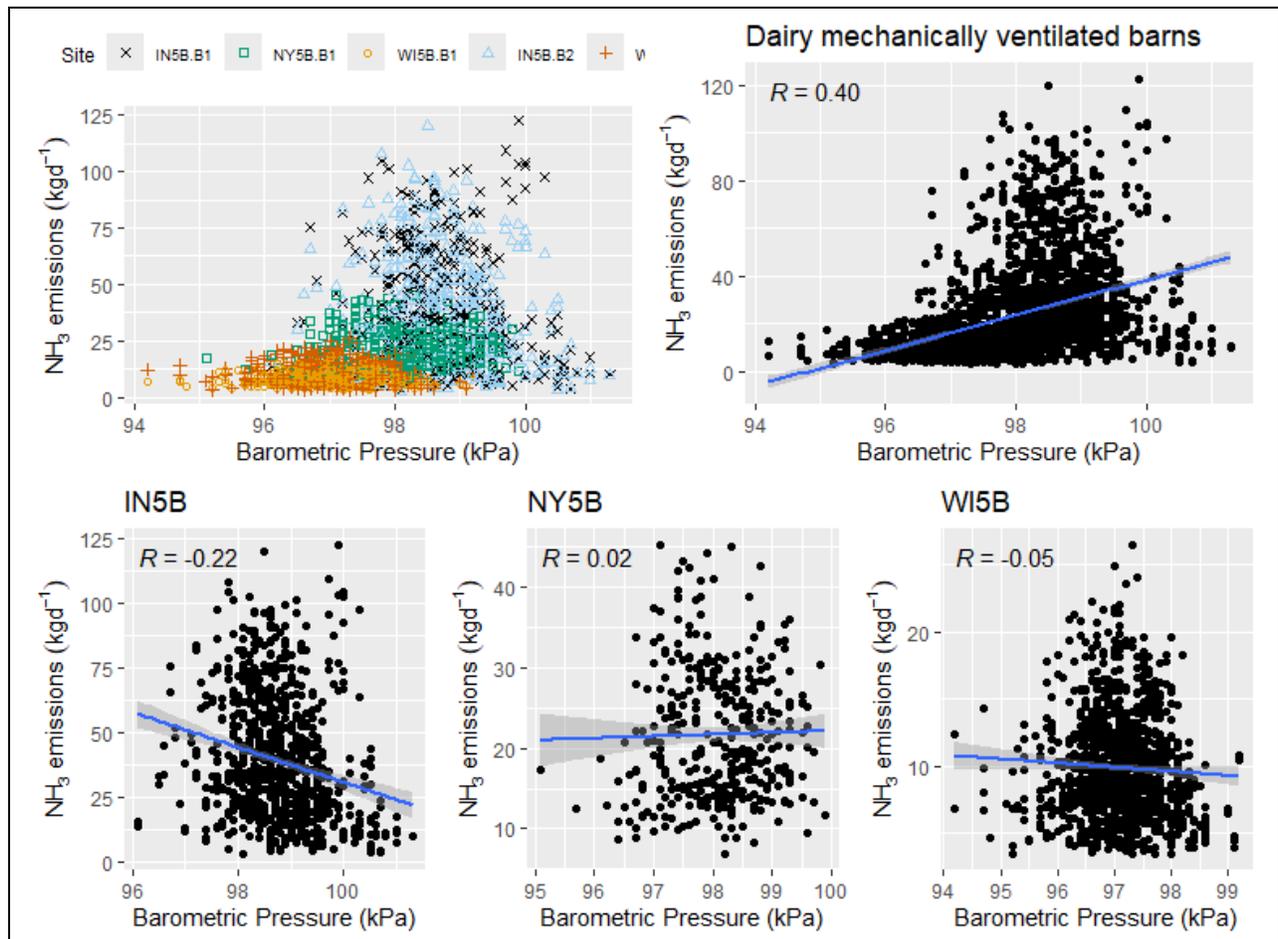


Figure 1.65: Scatter plot of dairy mechanically ventilated barns NH₃ emissions (kg d⁻¹) versus air pressure.

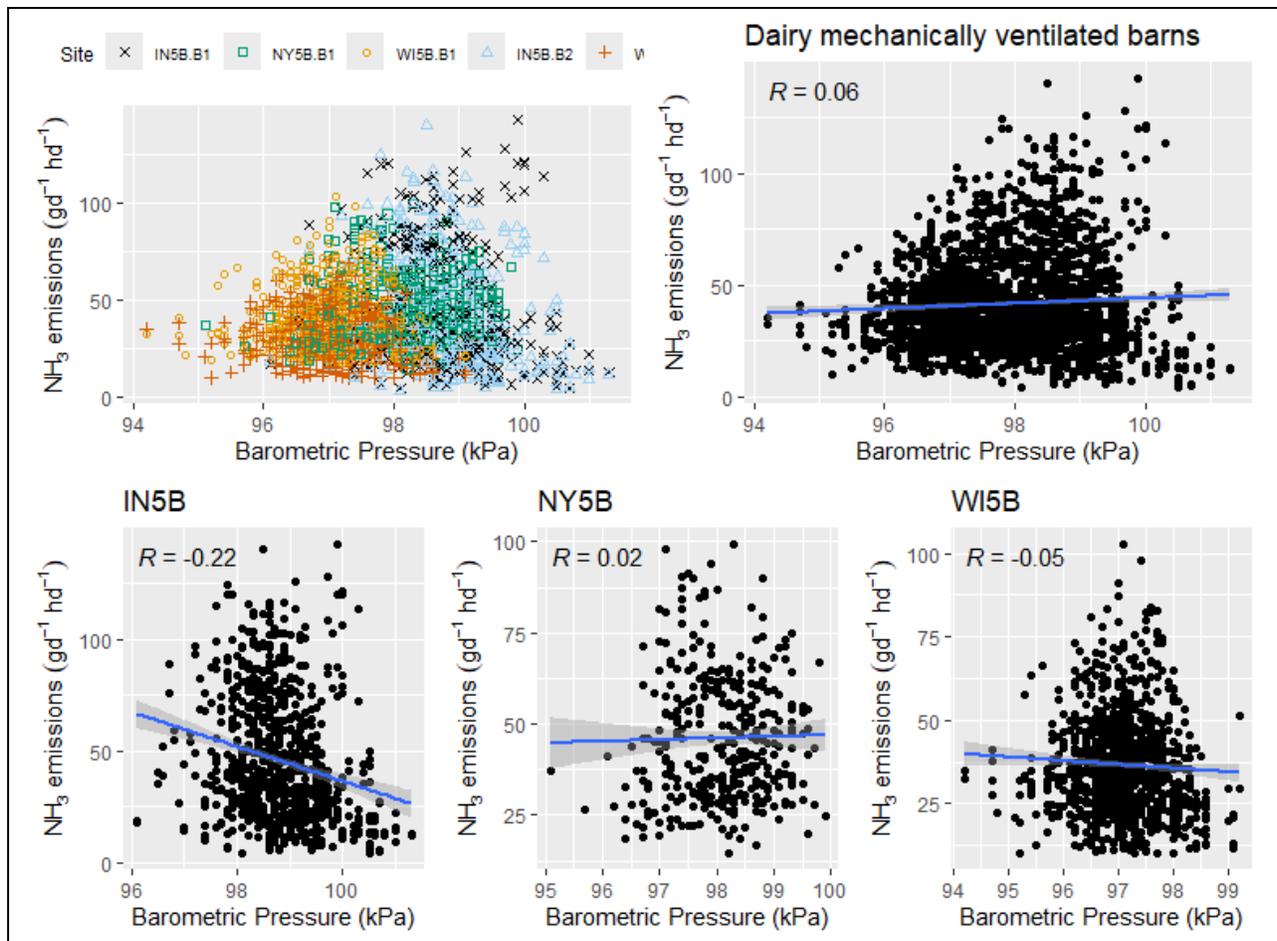


Figure 1.66: Scatter plot of dairy mechanically ventilated barns NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus air pressure.

1.2.2 Hydrogen Sulfide (H₂S)

1.2.2.1 Ambient temperature

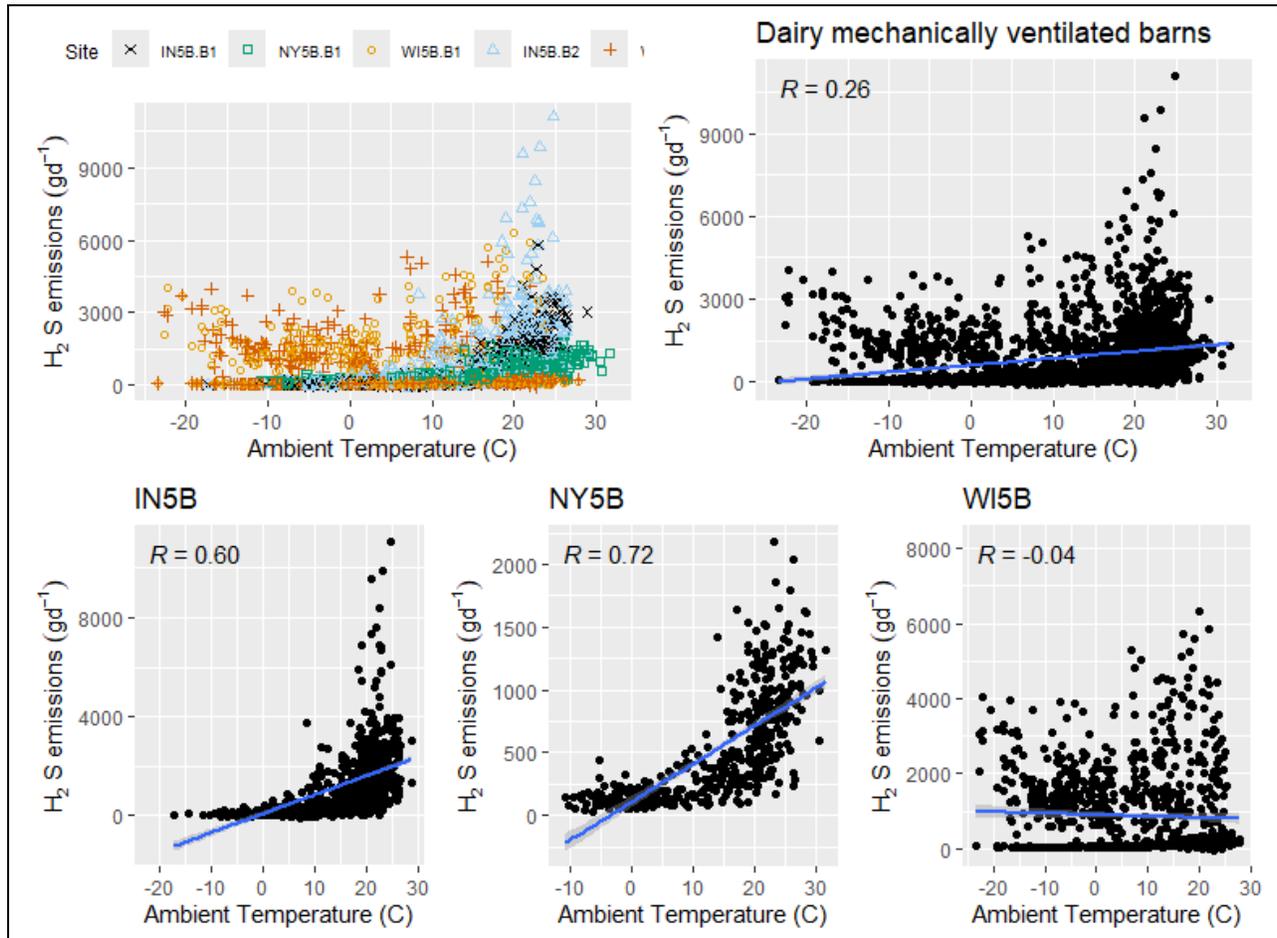


Figure 1.67: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus ambient temperature.

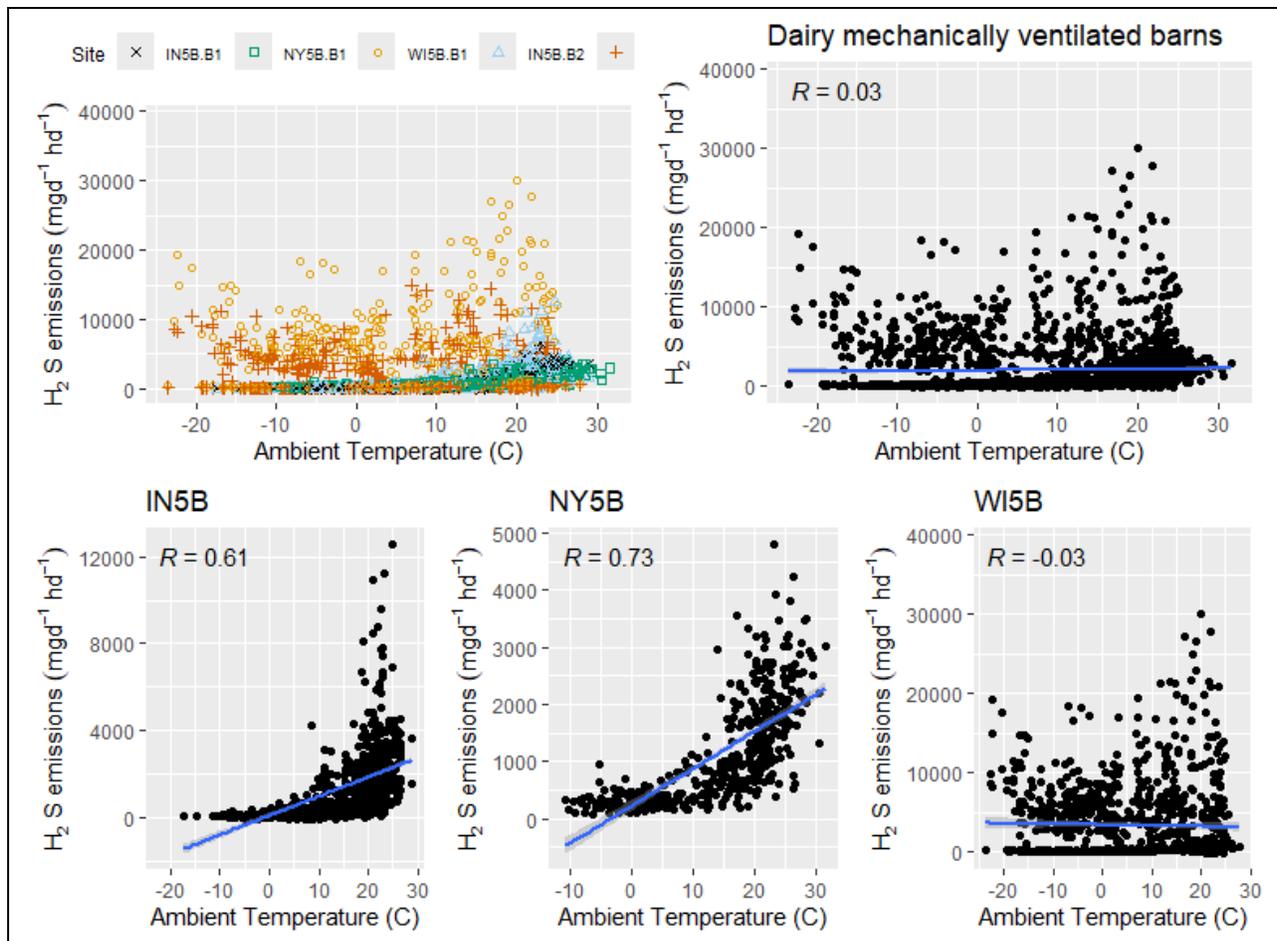


Figure 1.68: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

1.2.2.2 Ambient relative humidity

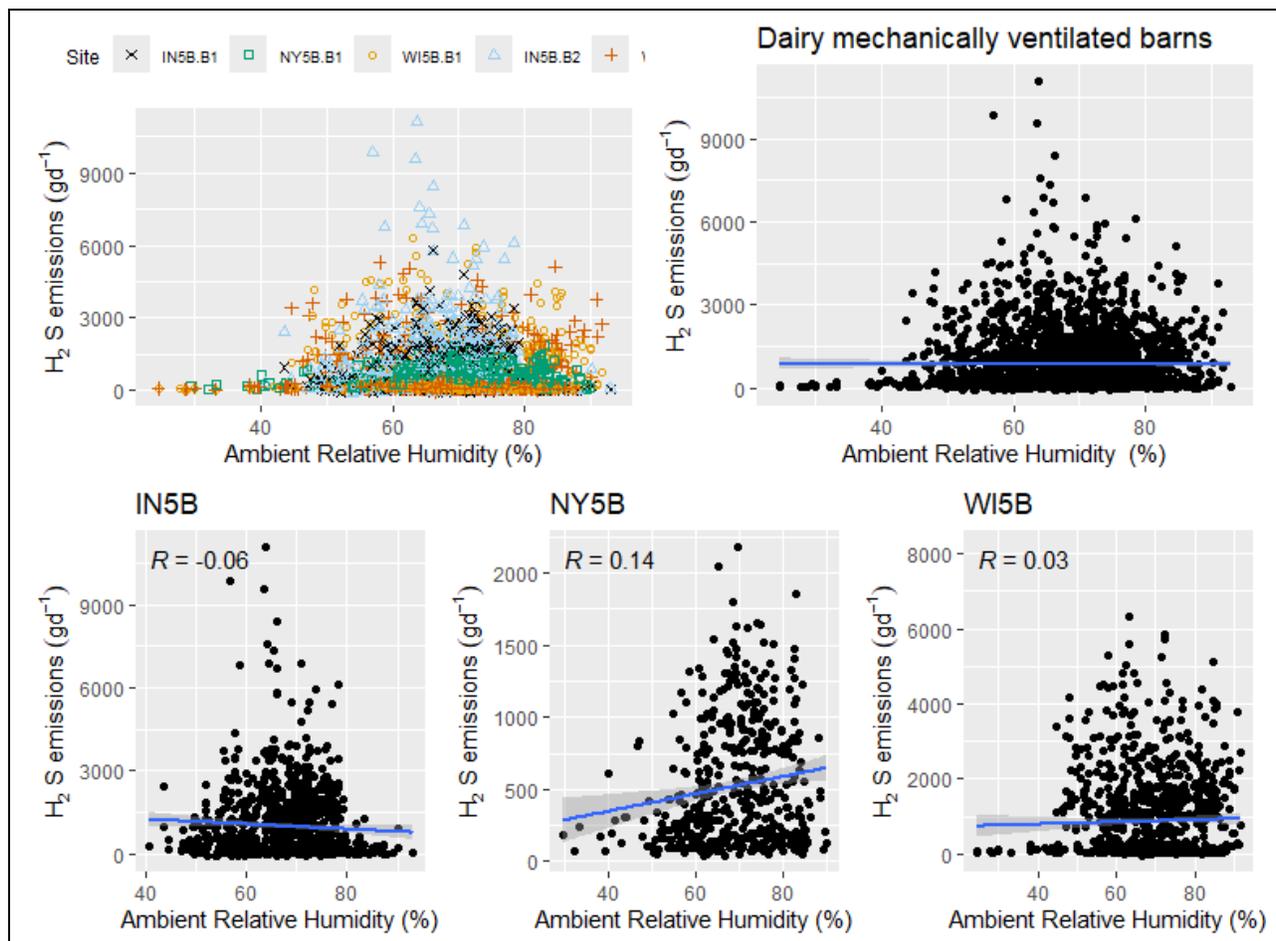


Figure 1.69: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus ambient relative humidity.

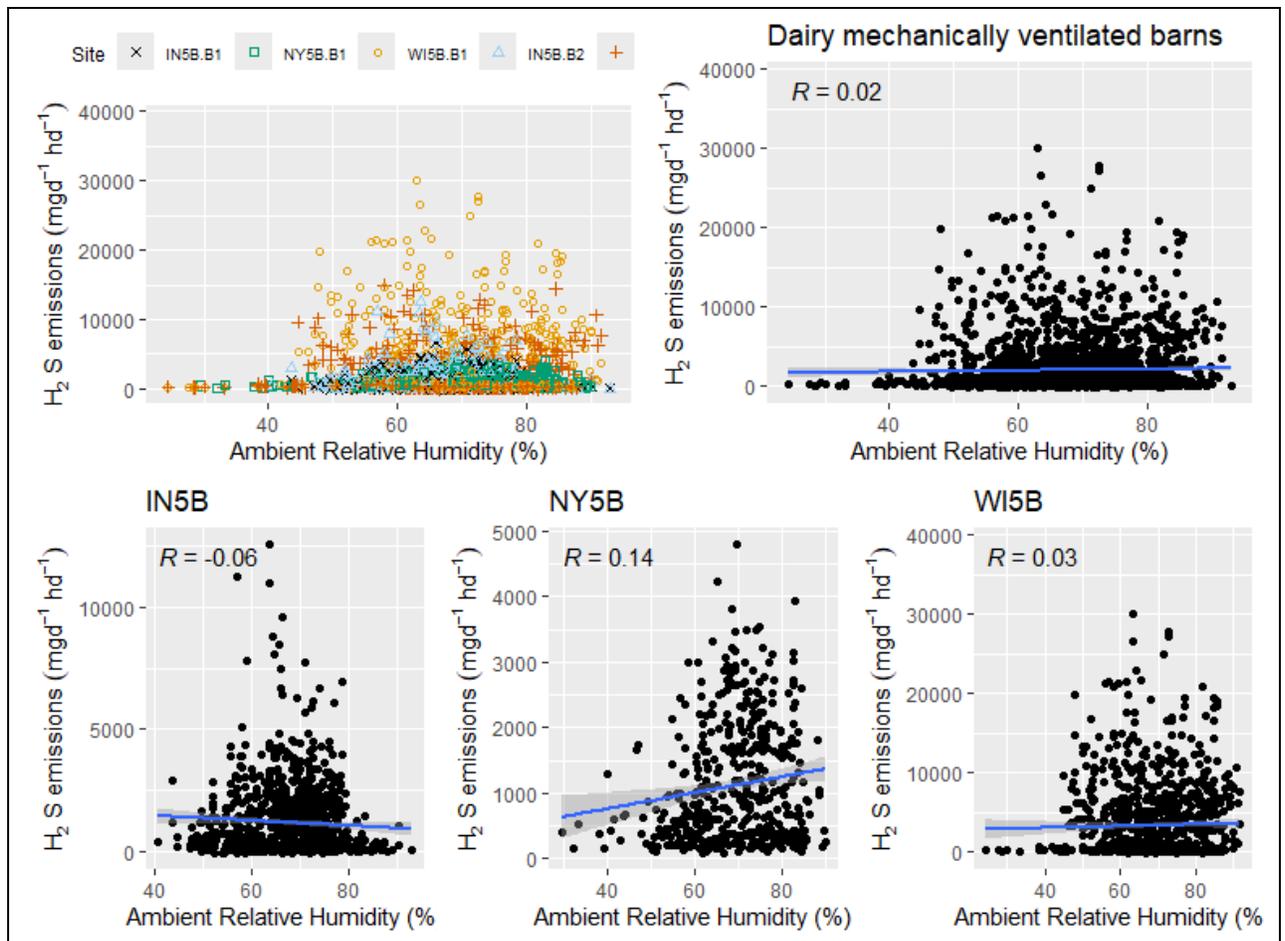


Figure 1.70: Scatter plot of dairy mechanically ventilated barns H_2S emissions ($mg\ d^{-1}hd^{-1}$) versus ambient relative humidity.

1.2.2.3 Air pressure

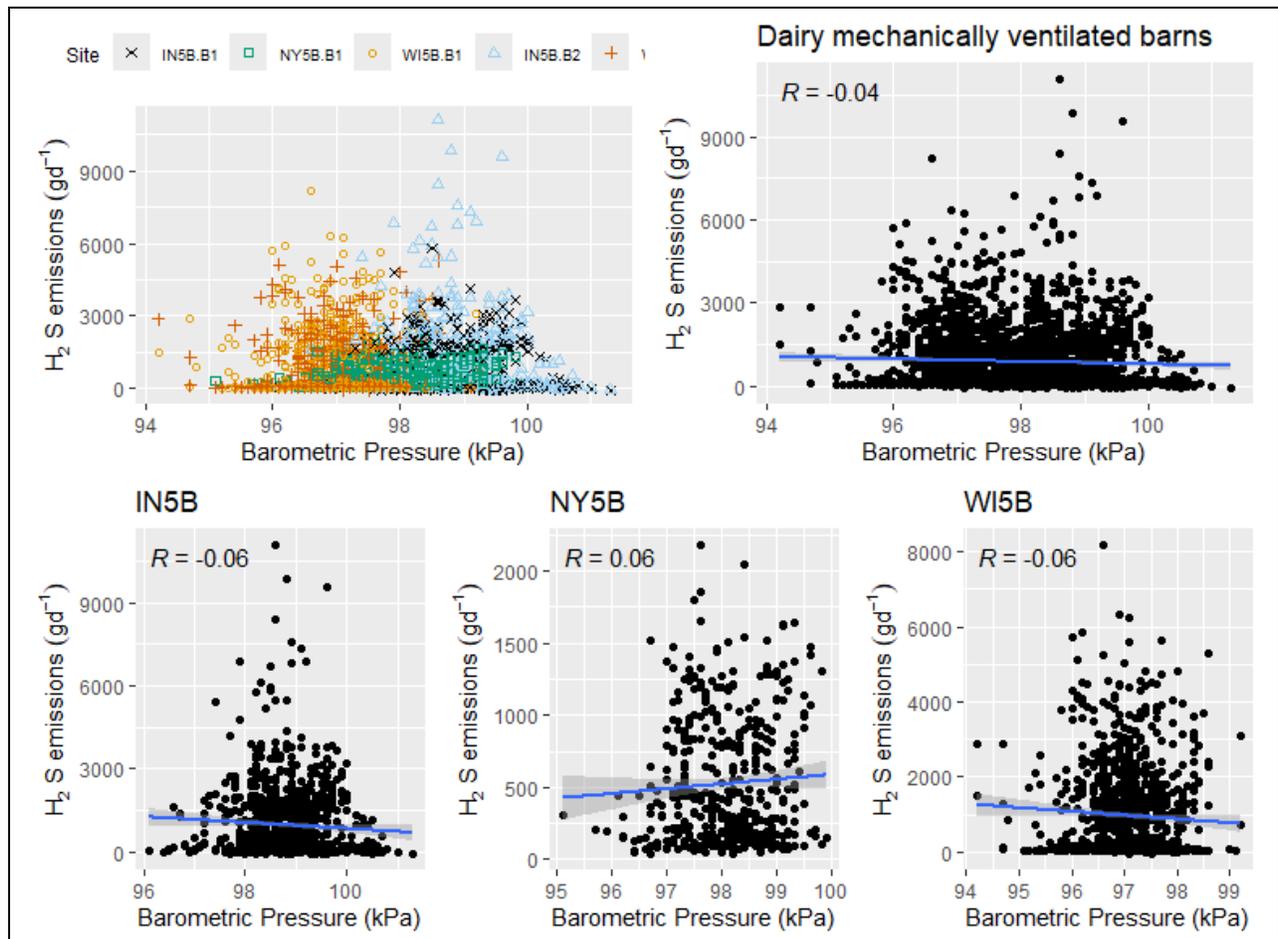


Figure 1.71: Scatter plot of dairy mechanically ventilated barns H₂S emissions (g d⁻¹) versus air pressure.

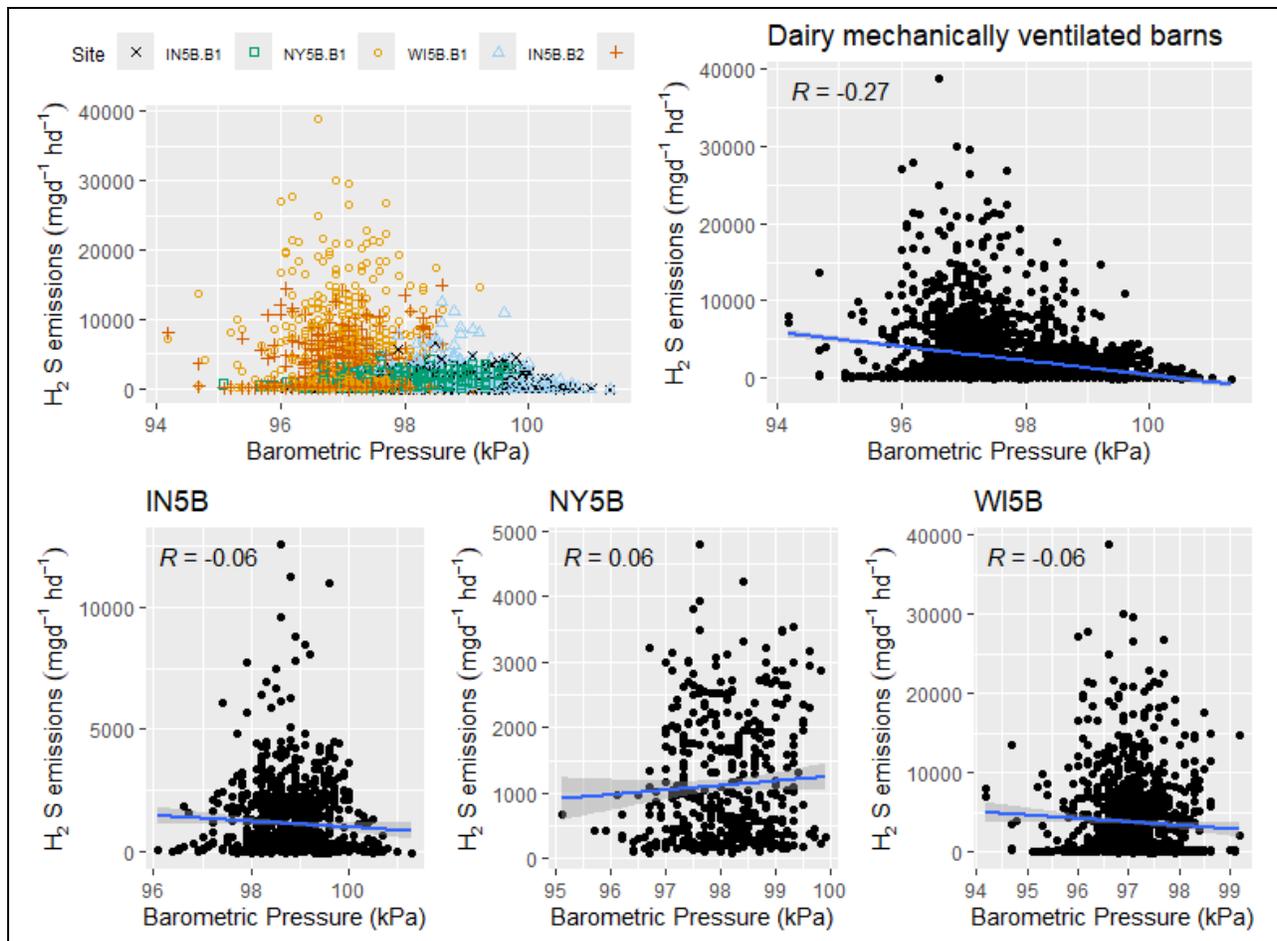


Figure 1.72: Scatter plot of dairy mechanically ventilated barns H₂S emissions (mg d⁻¹hd⁻¹) versus air pressure.

1.2.3 Particulate Matter (PM₁₀)

1.2.3.1 Ambient temperature

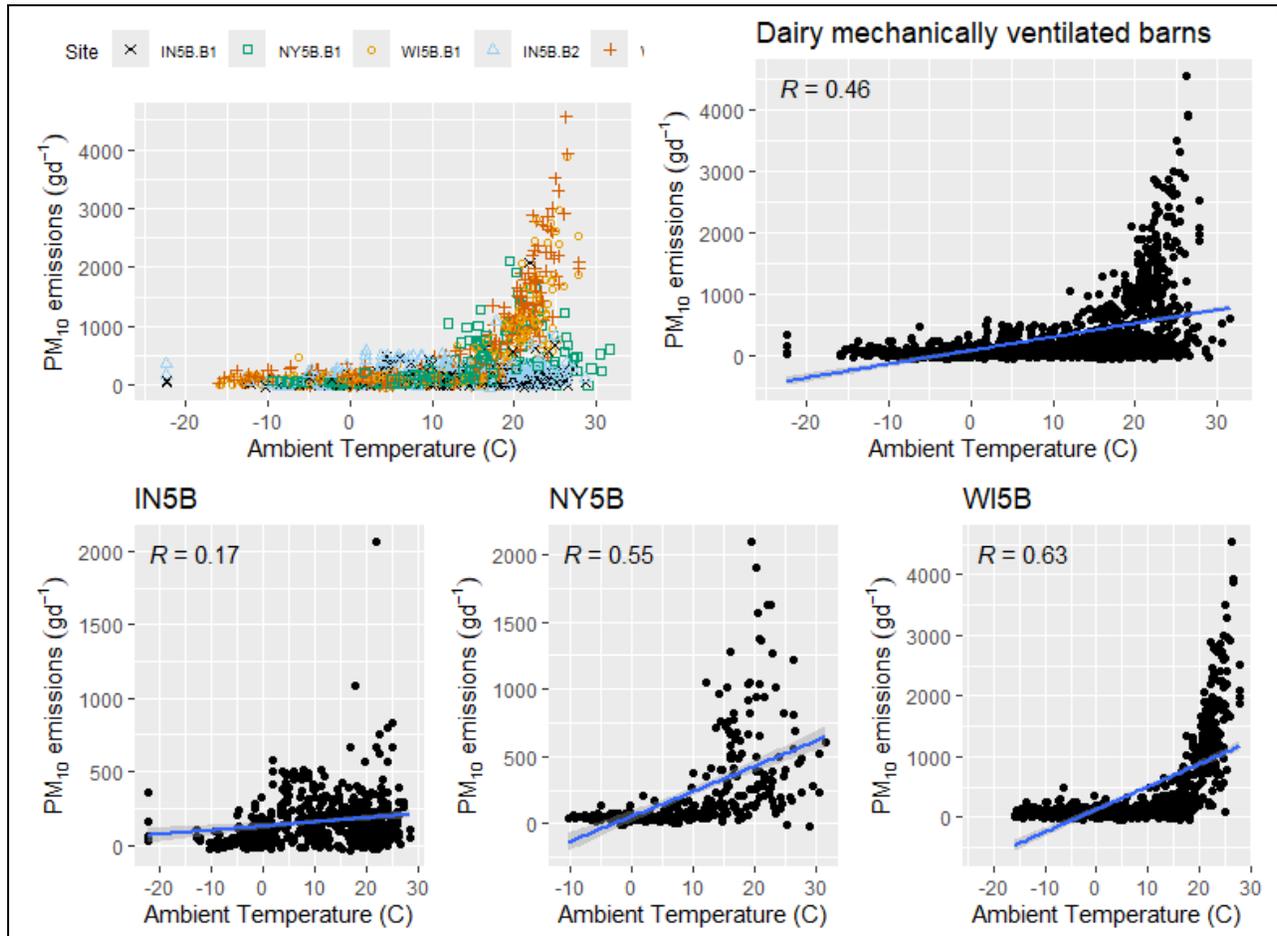


Figure 1.73: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus ambient temperature.

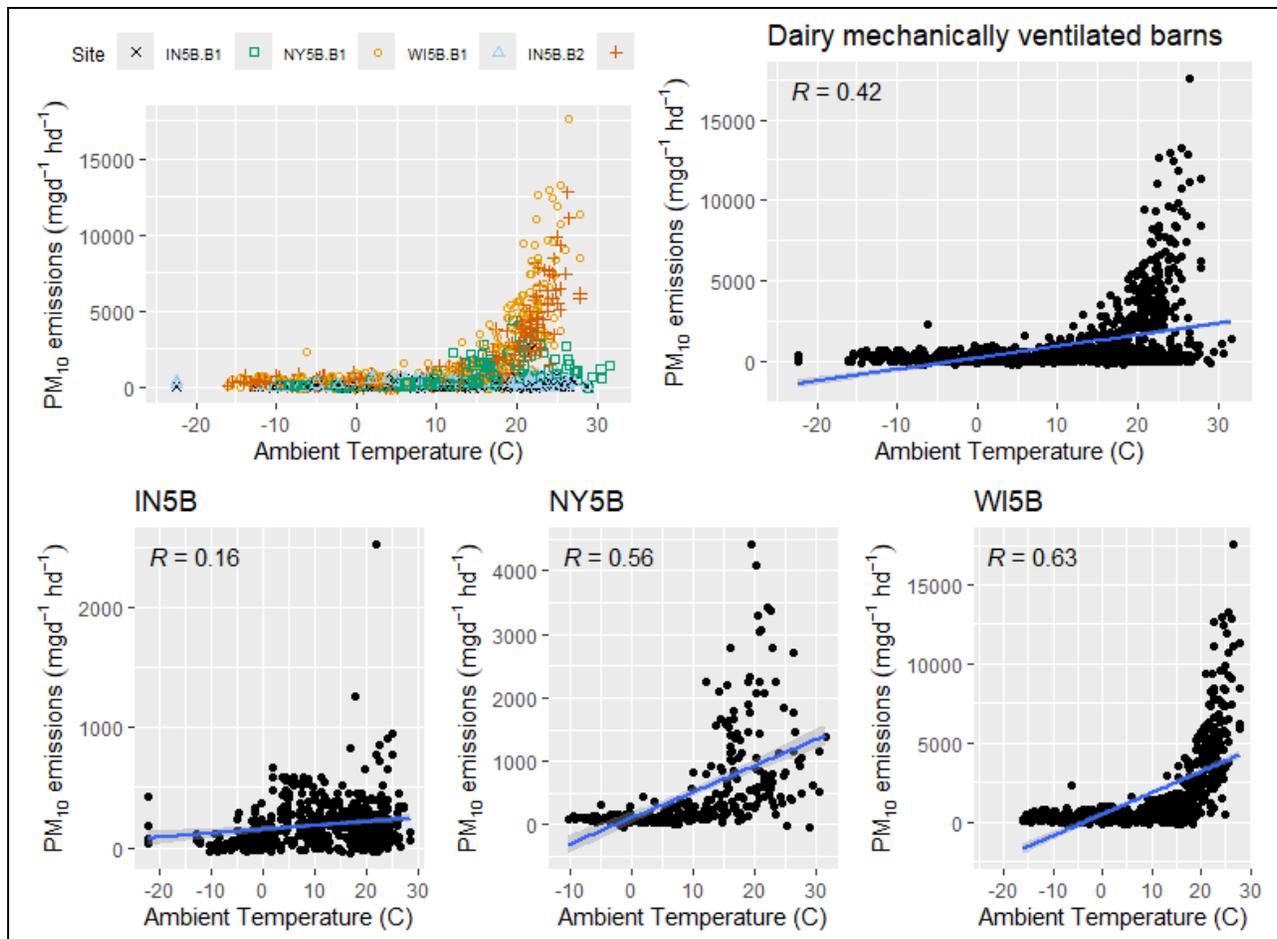


Figure 1.74: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

1.2.3.2 Ambient relative humidity

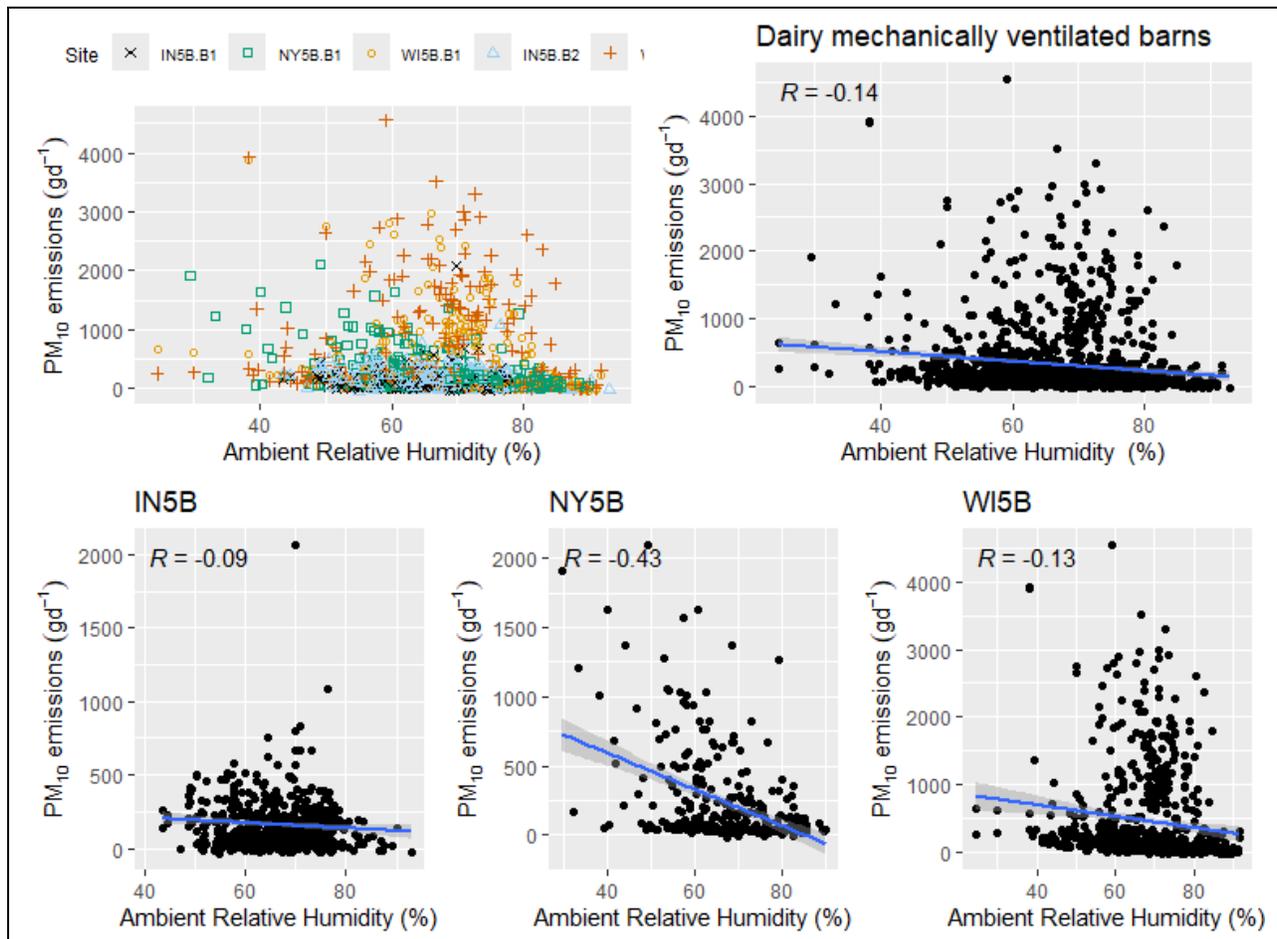


Figure 1.75: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus ambient relative humidity.

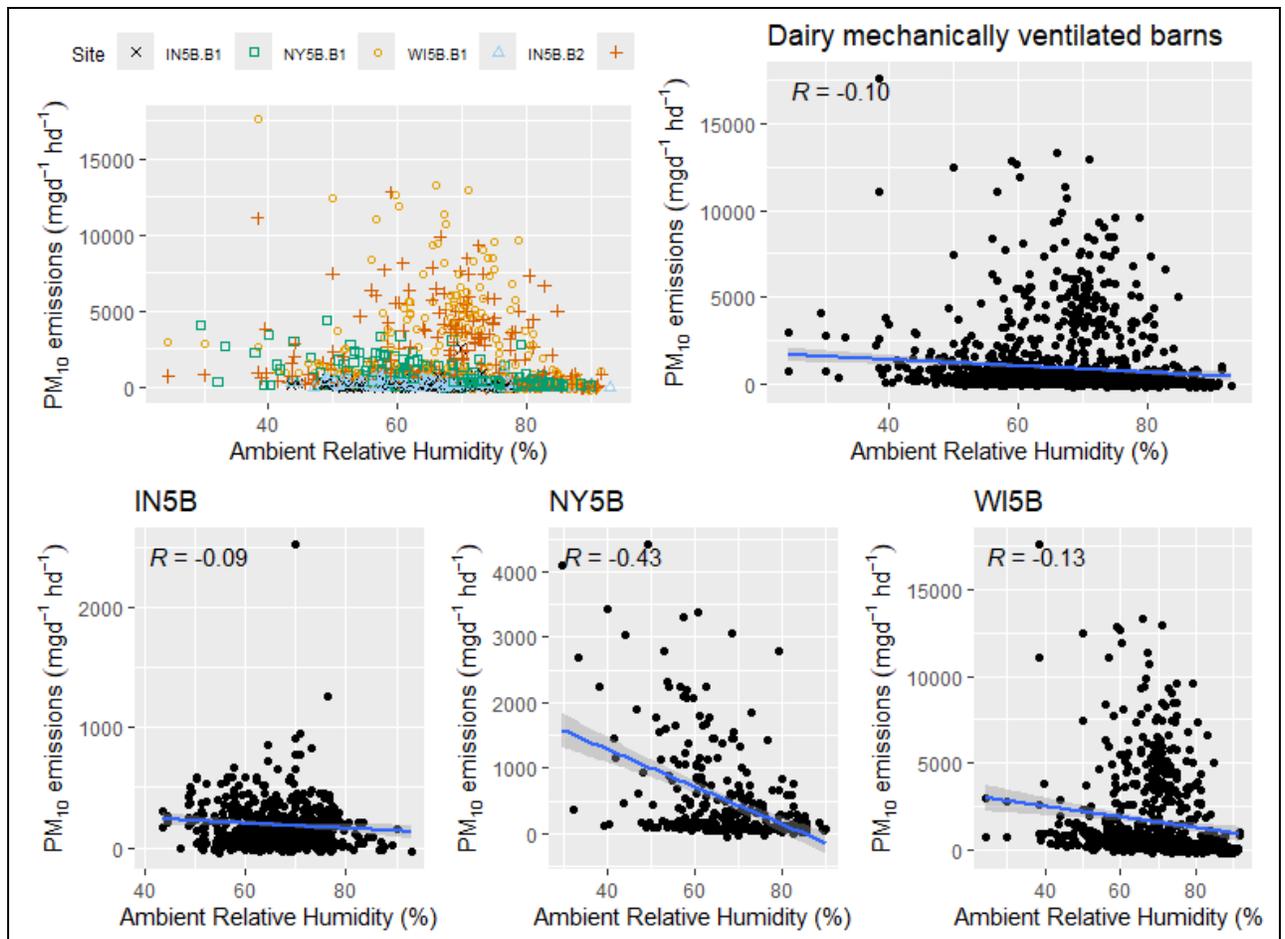


Figure 1.76: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

1.2.3.3 Air pressure

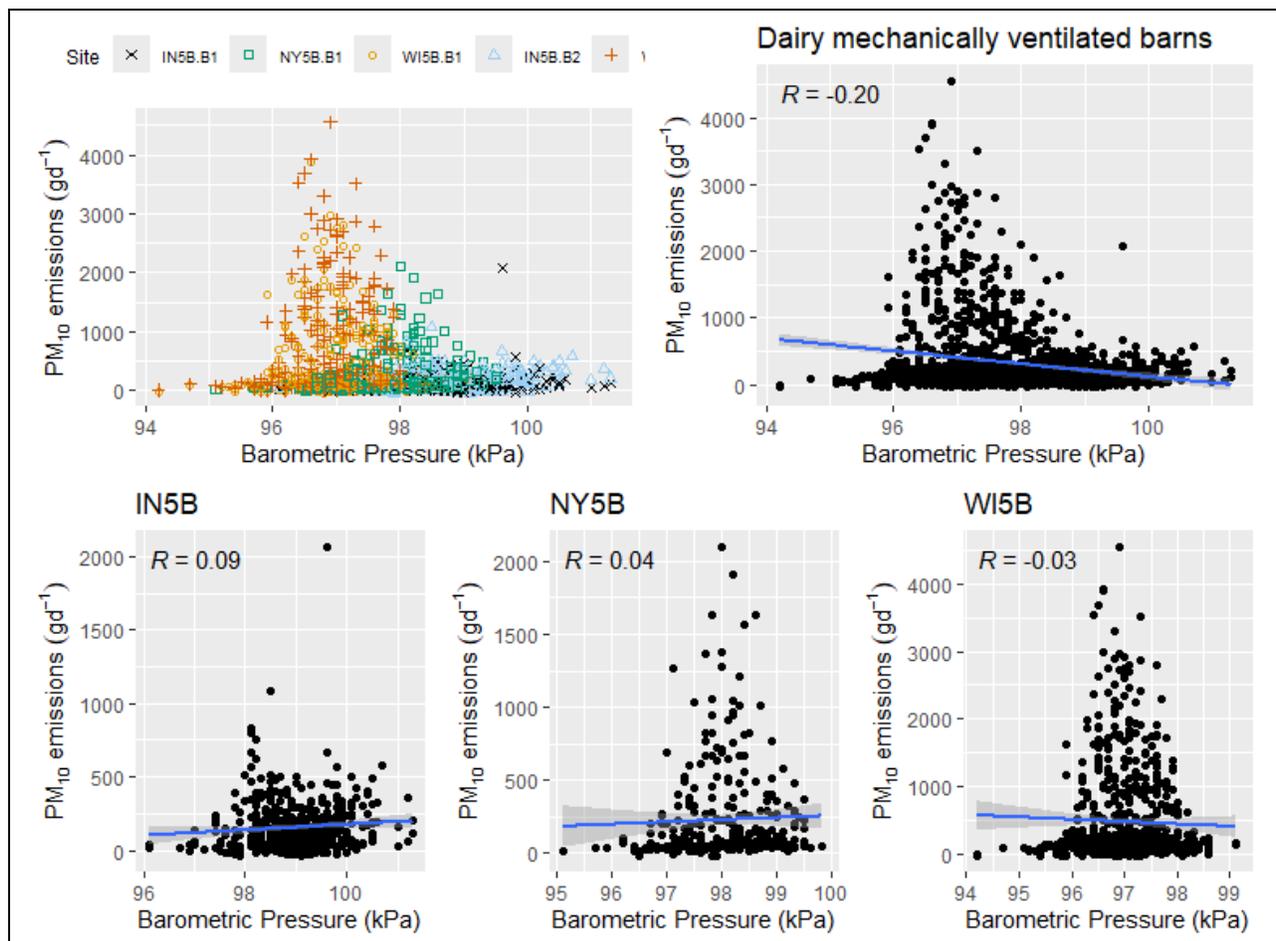


Figure 1.77: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (g d⁻¹) versus air pressure.

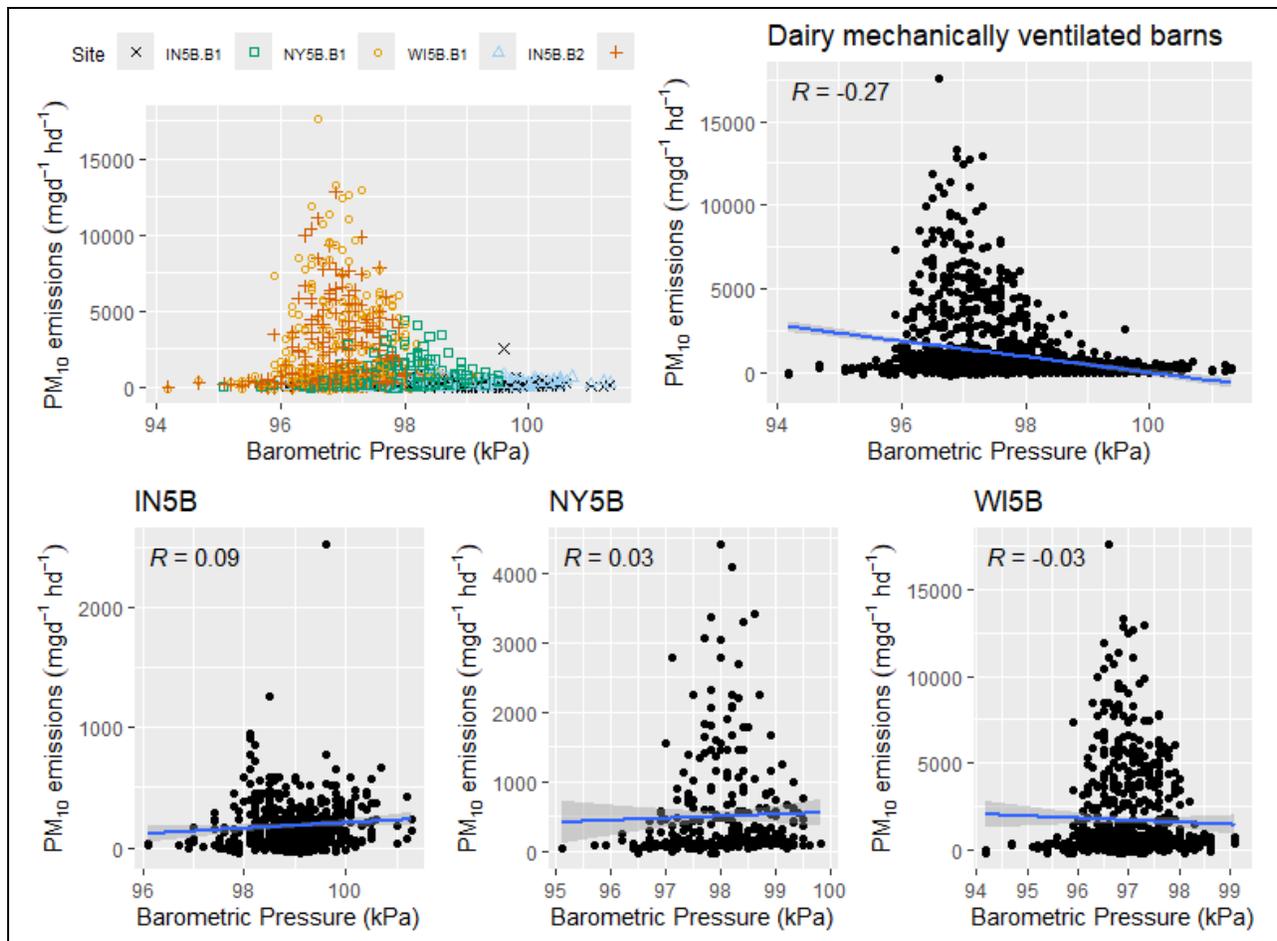


Figure 1.78: Scatter plot of dairy mechanically ventilated barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus air pressure.

1.2.4 Particulate Matter (PM_{2.5})

1.2.4.1 Ambient temperature

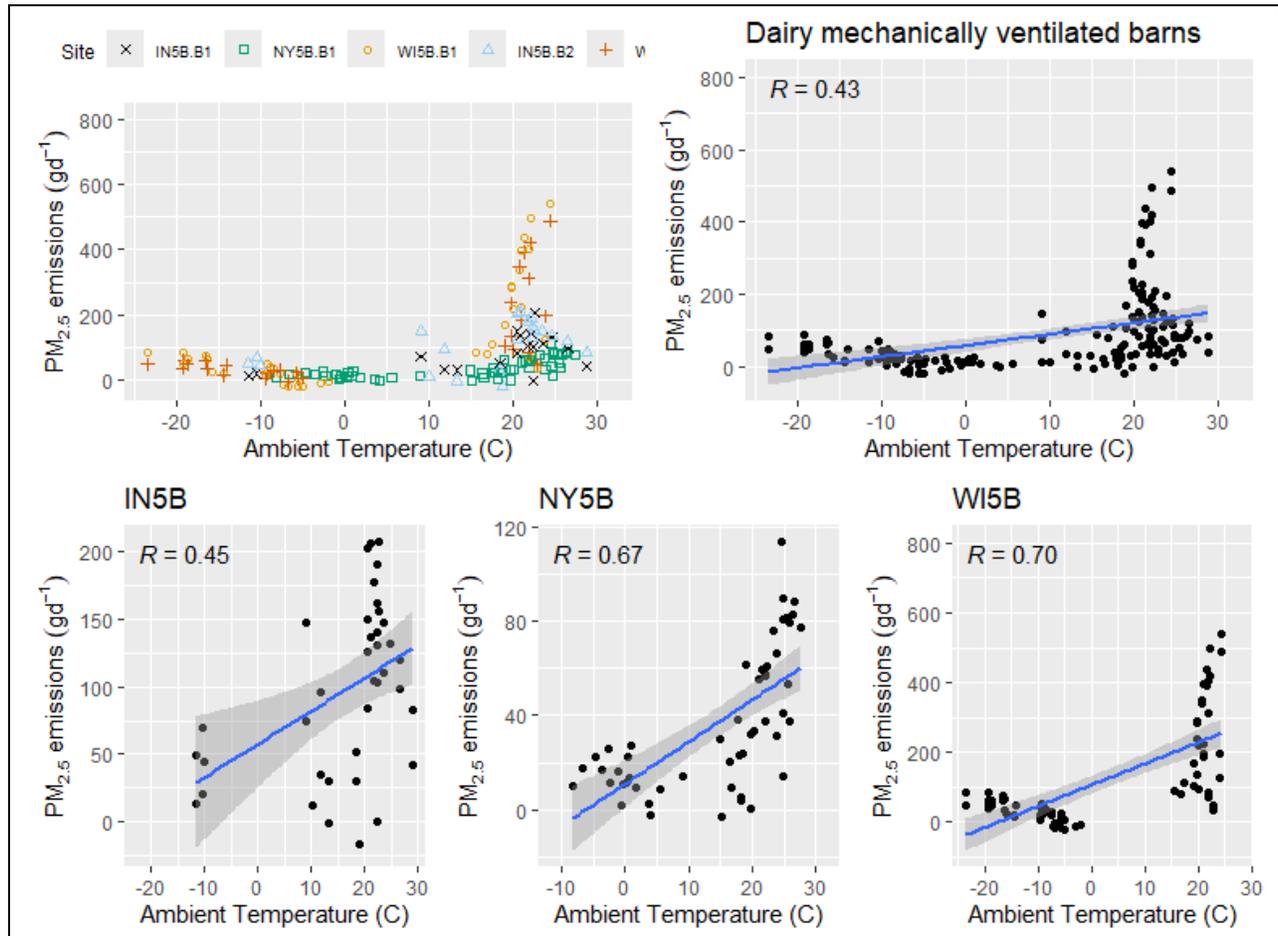


Figure 1.79: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus ambient temperature.

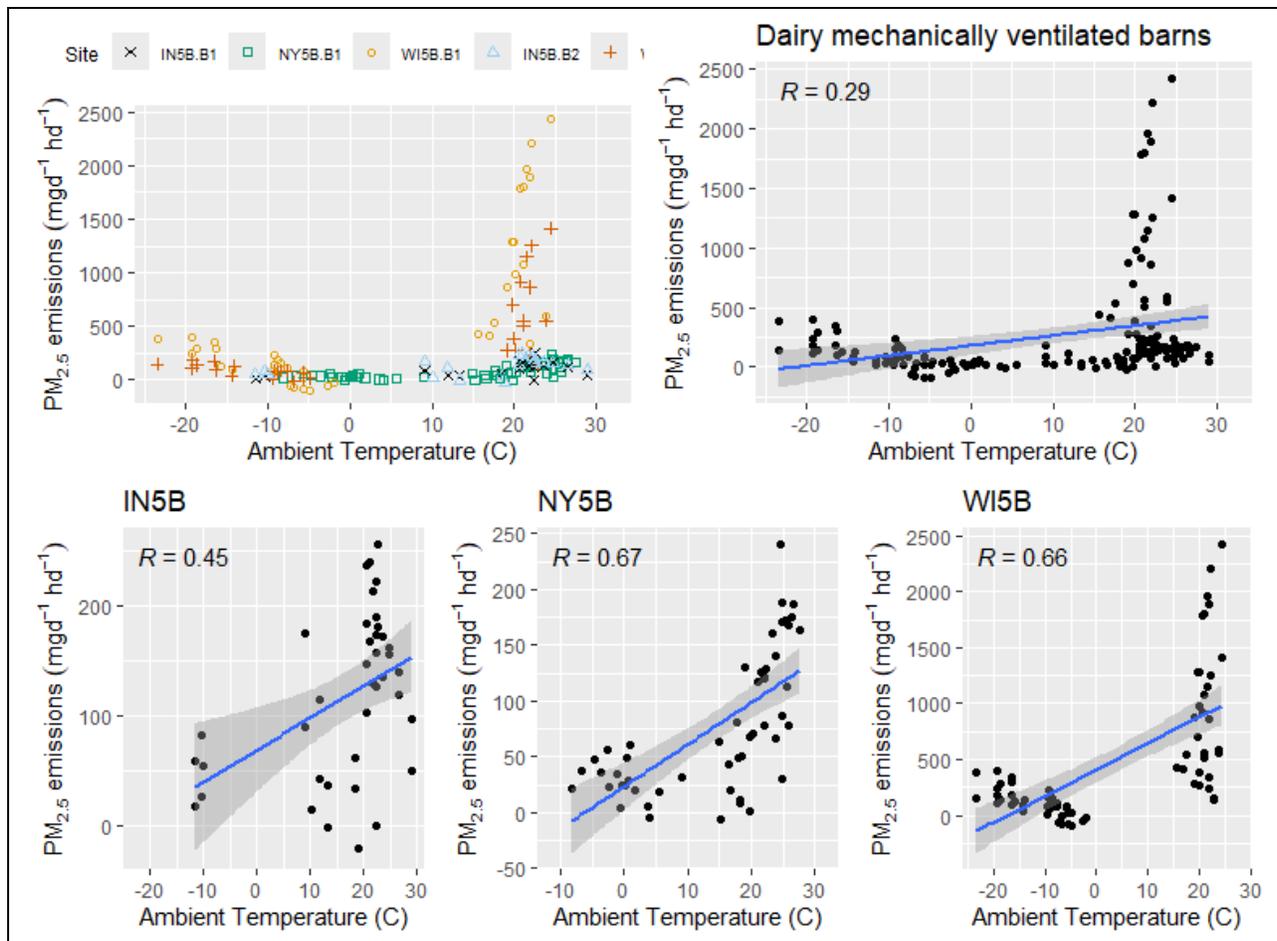


Figure 1.80: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

1.2.4.2 Ambient relative humidity

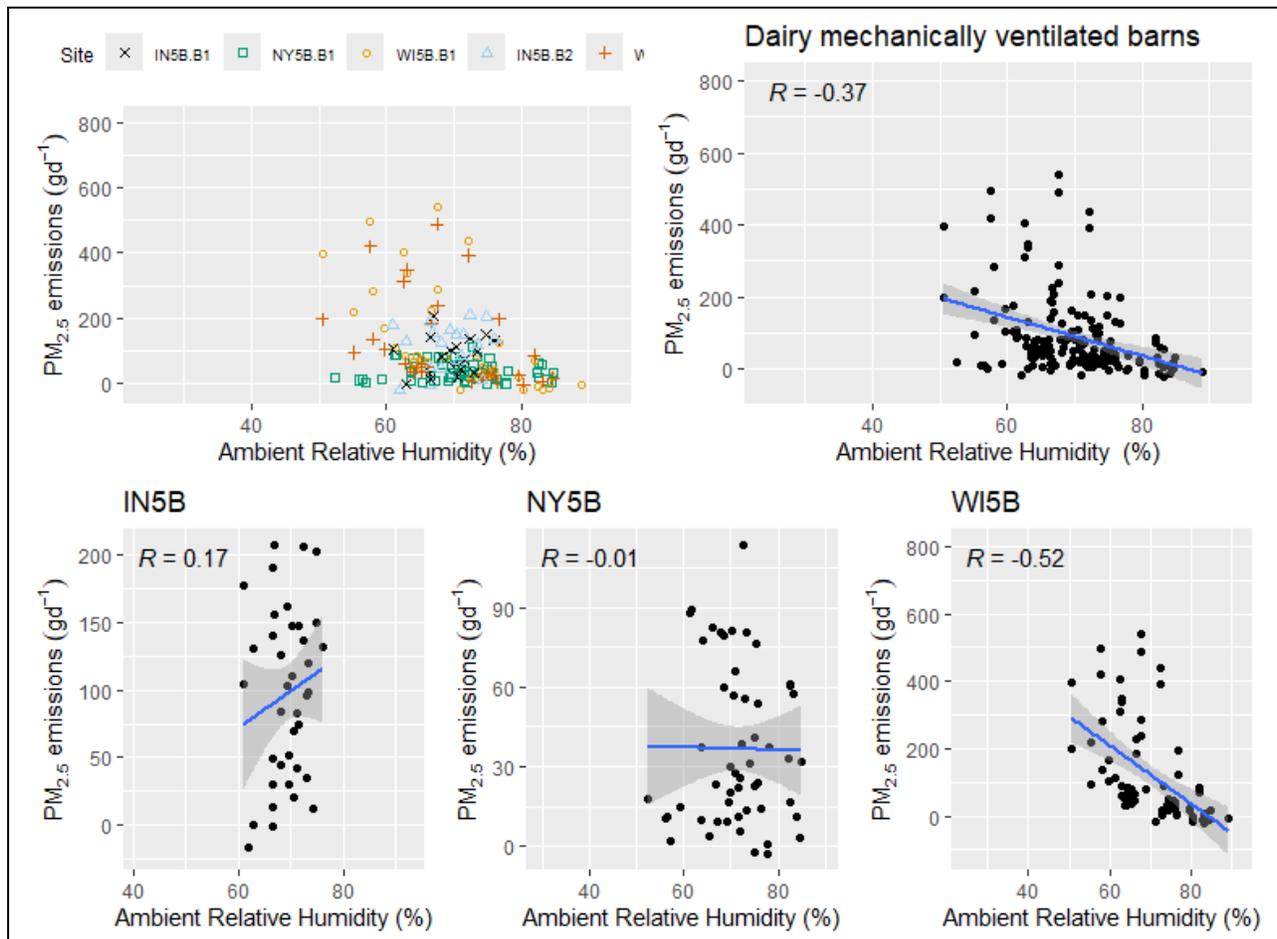


Figure 1.81: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus ambient relative humidity.

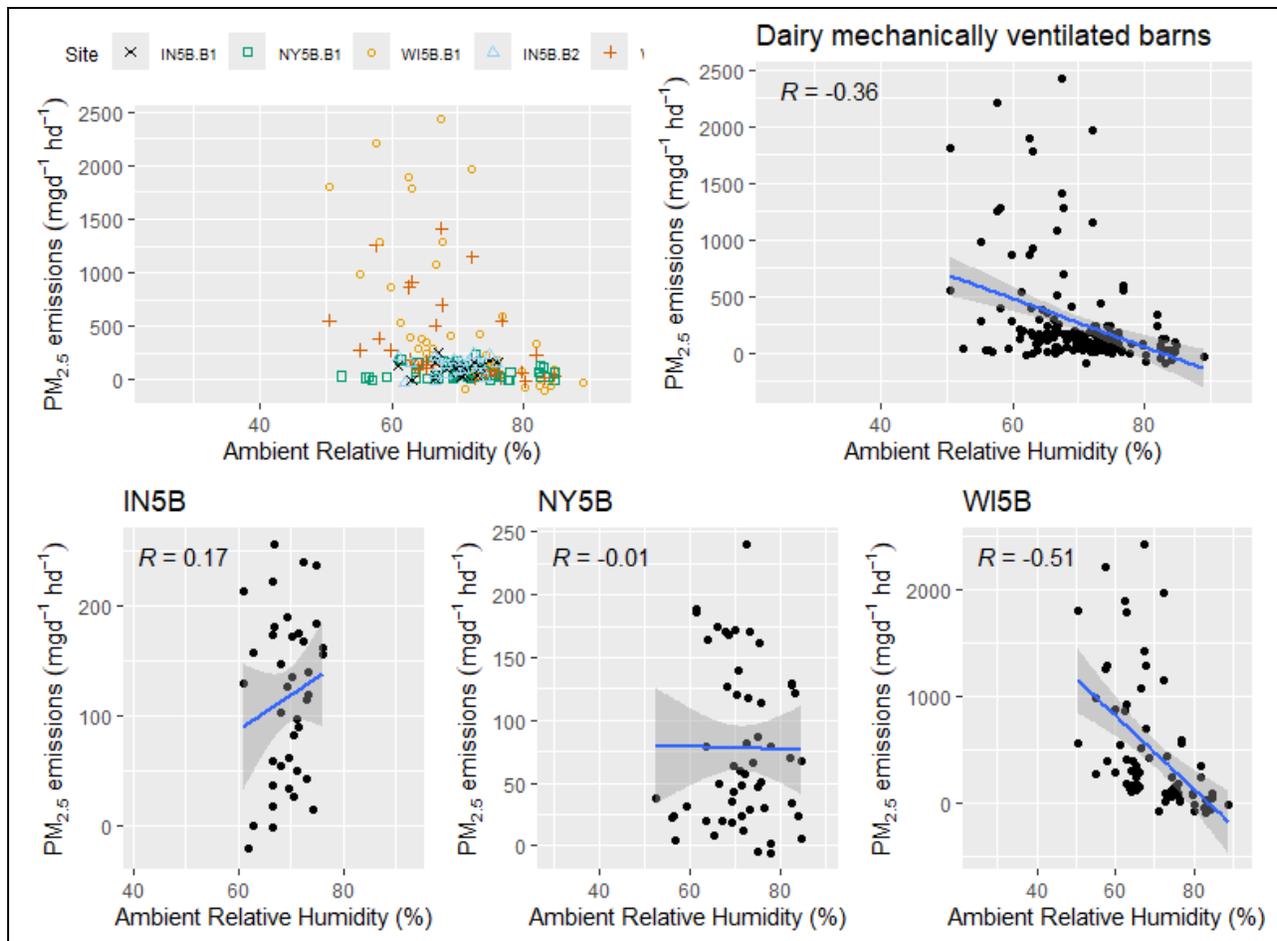


Figure 1.82: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

1.2.4.3 Air pressure

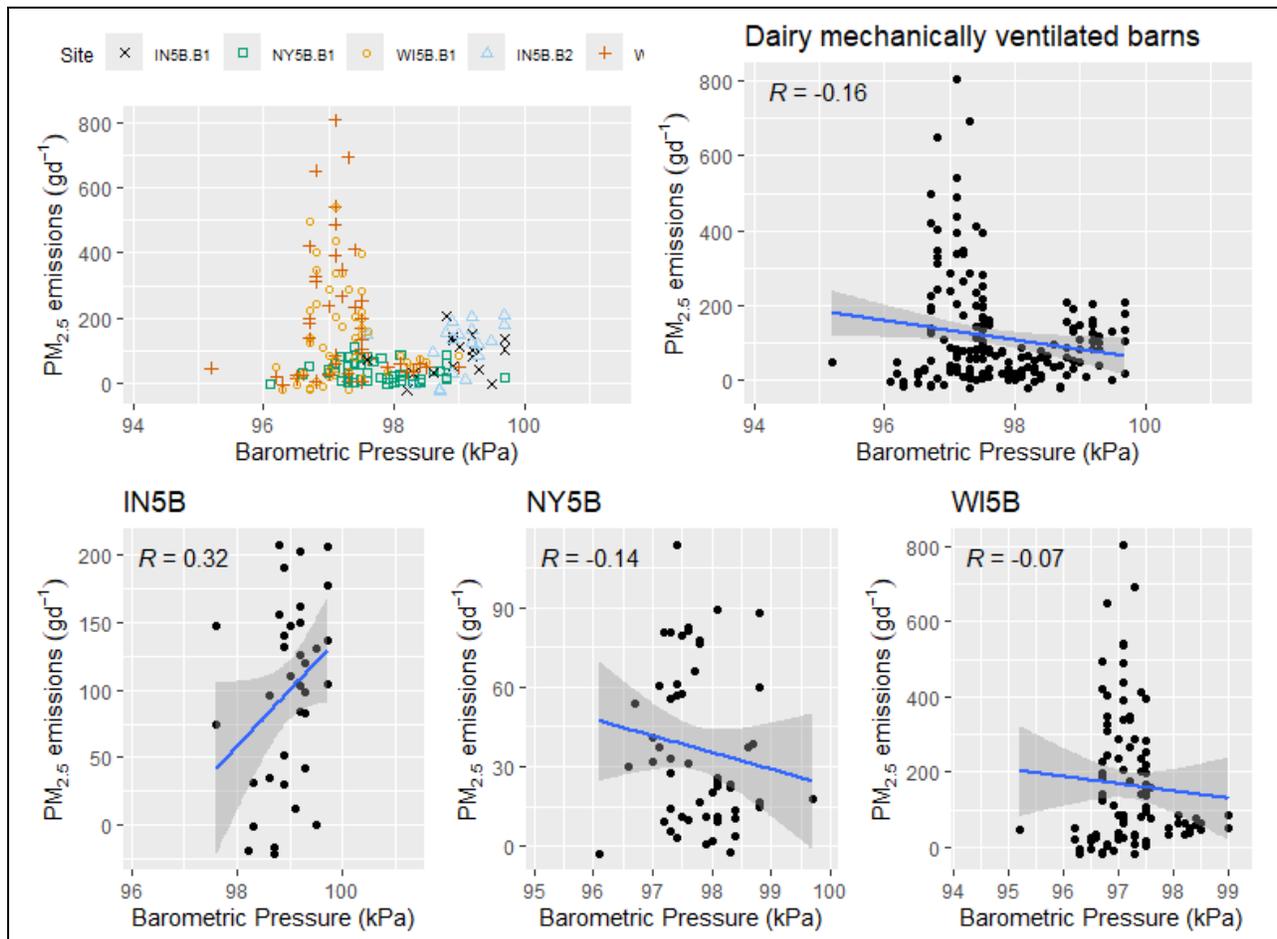


Figure 1.83: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (g d⁻¹) versus air pressure.

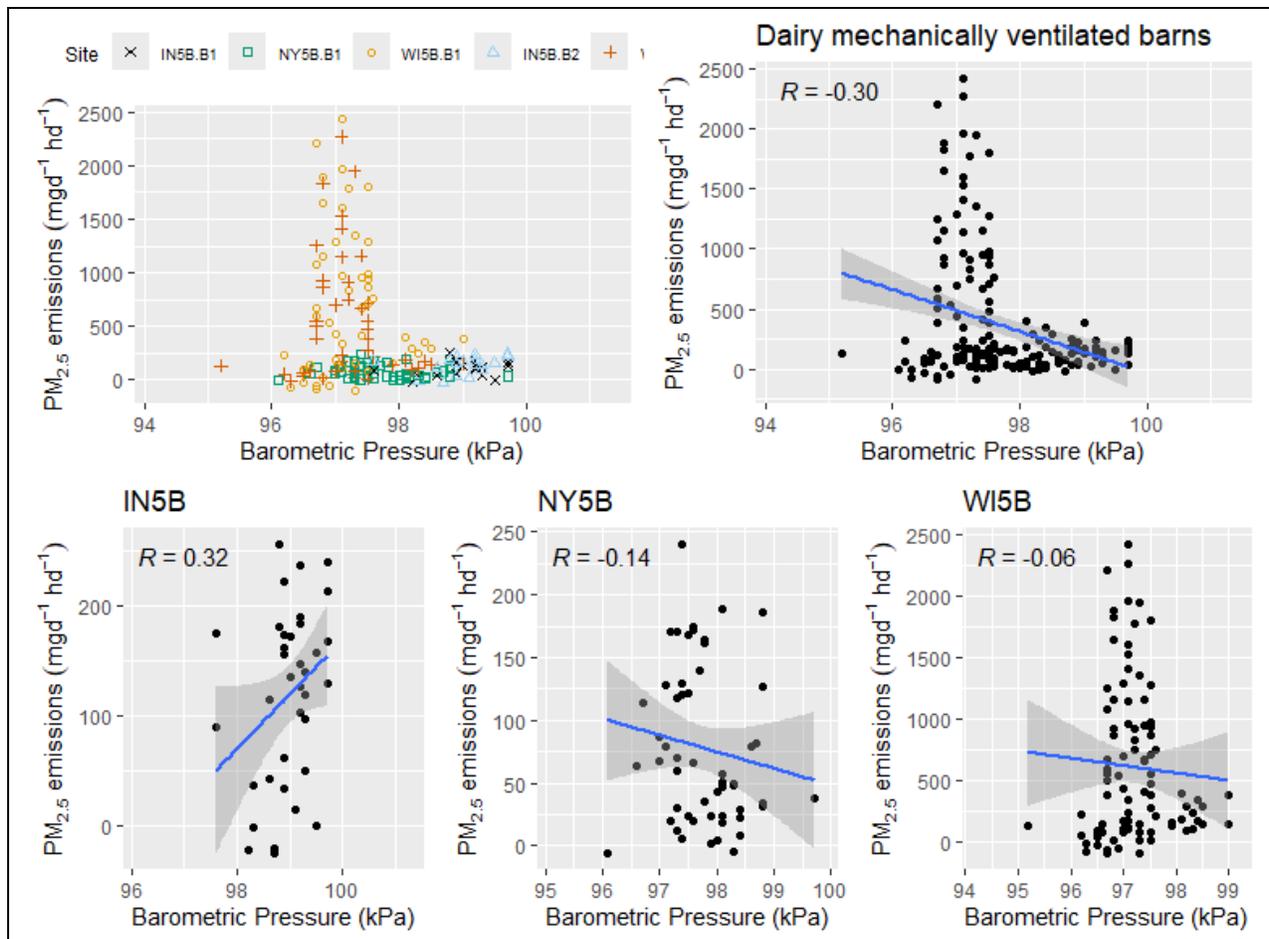


Figure 1.84: Scatter plot of dairy mechanically ventilated barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus air pressure.

1.2.5 Total Suspended Particulates (TSP)

1.2.5.1 Ambient temperature

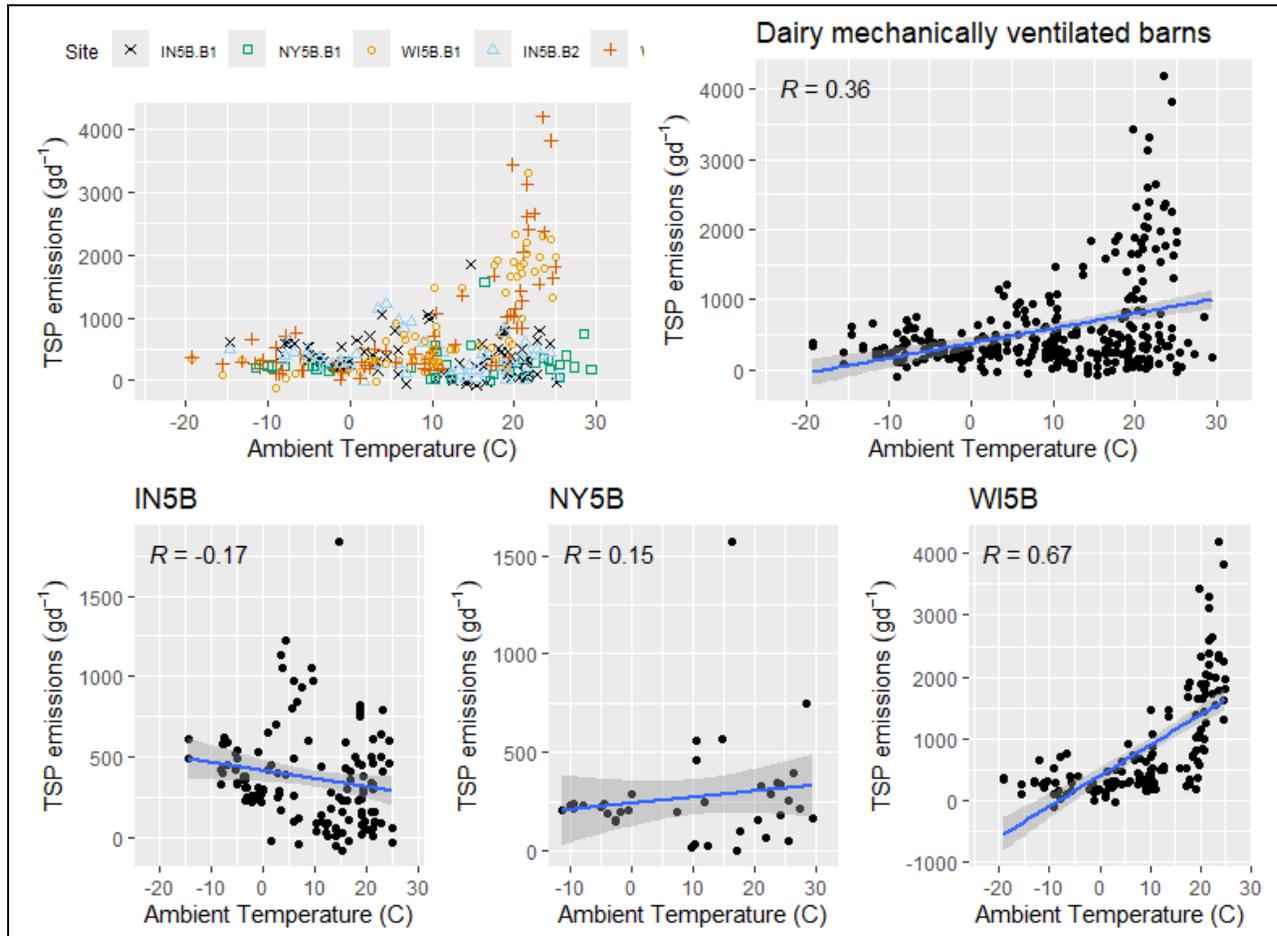


Figure 1.85: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d^{-1}) versus ambient temperature.

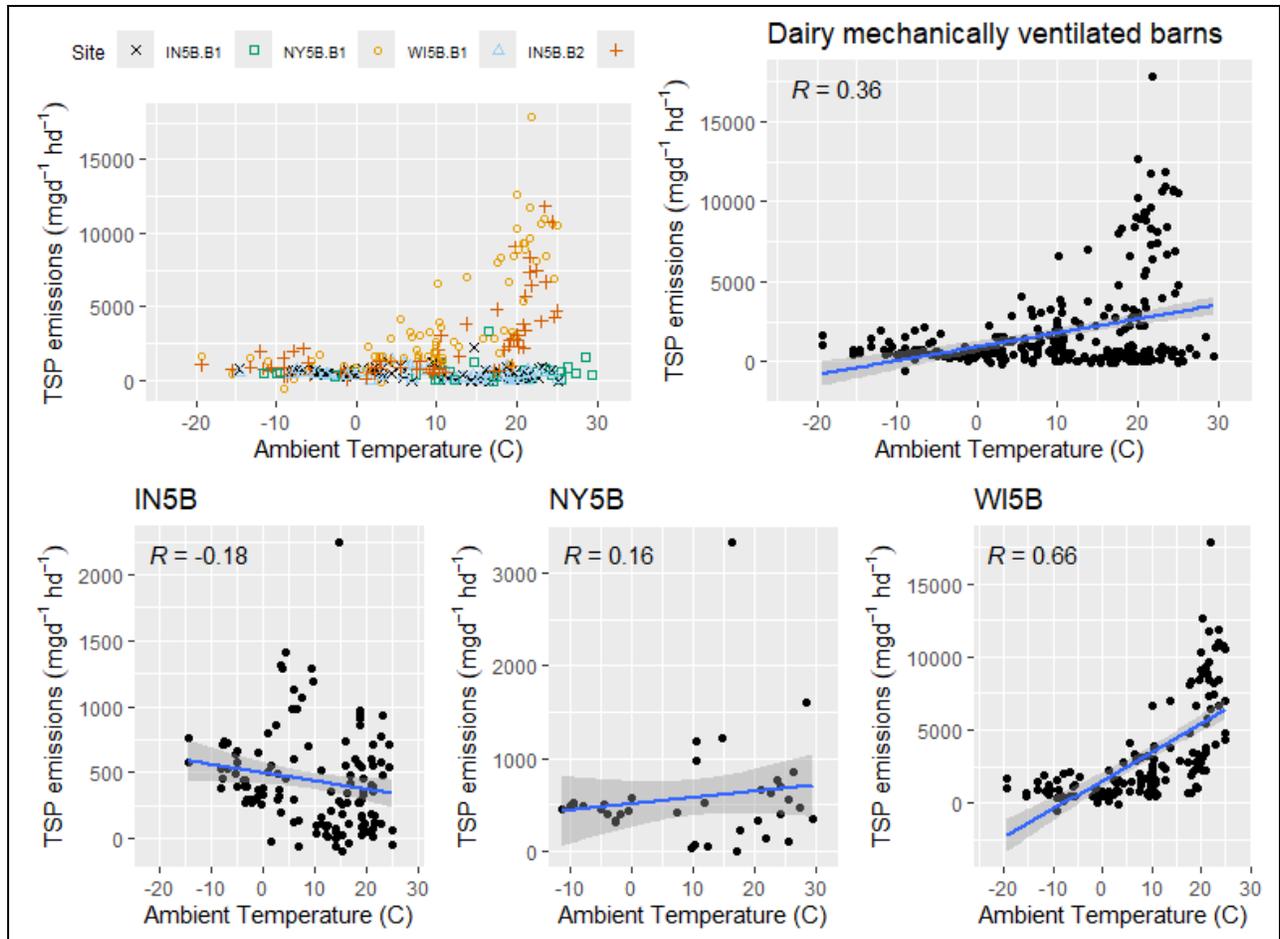


Figure 1.86: Scatter plot of dairy mechanically ventilated barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus ambient temperature.

1.2.5.2 Ambient relative humidity

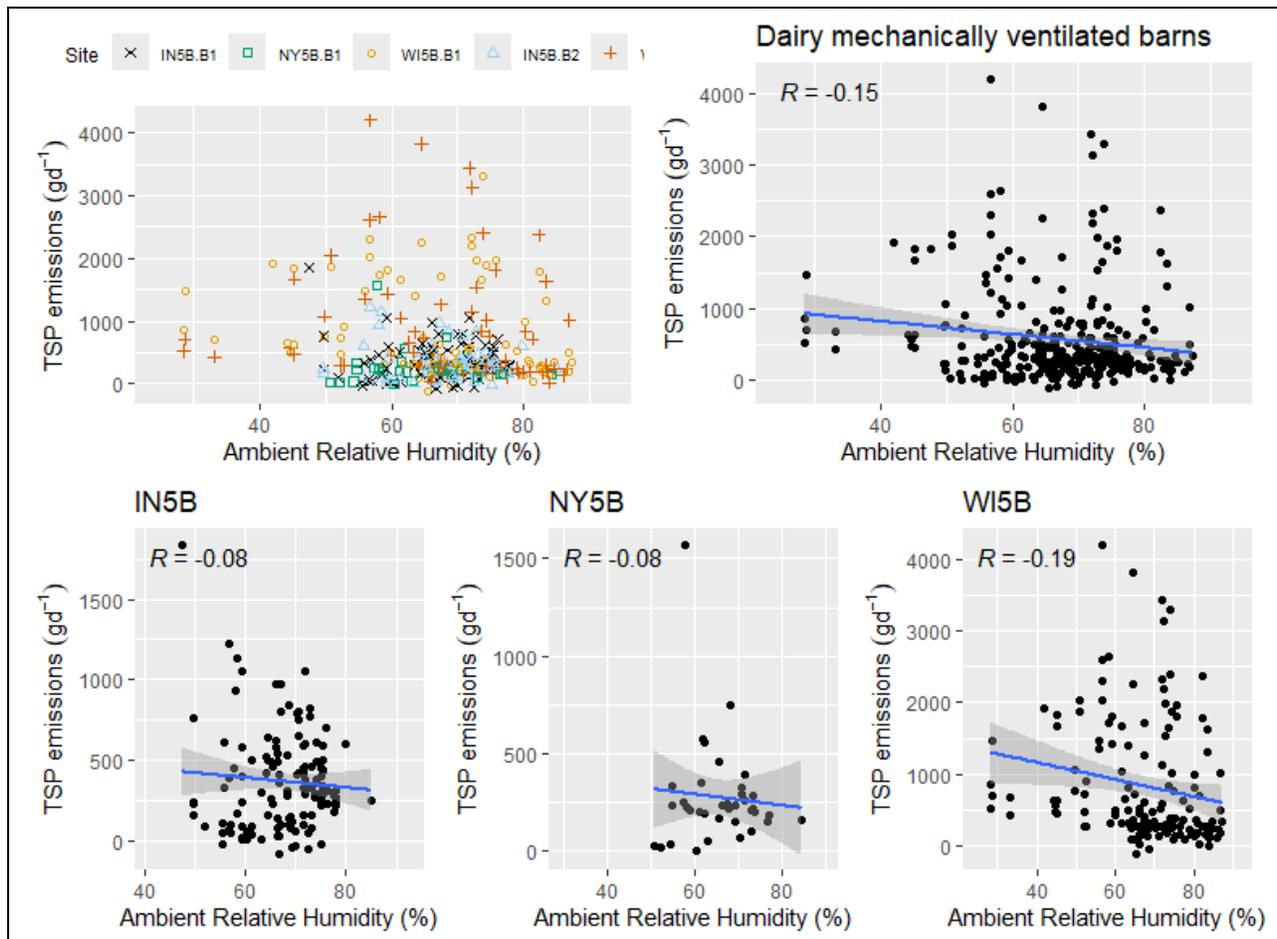


Figure 1.87: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d^{-1}) versus ambient relative humidity.

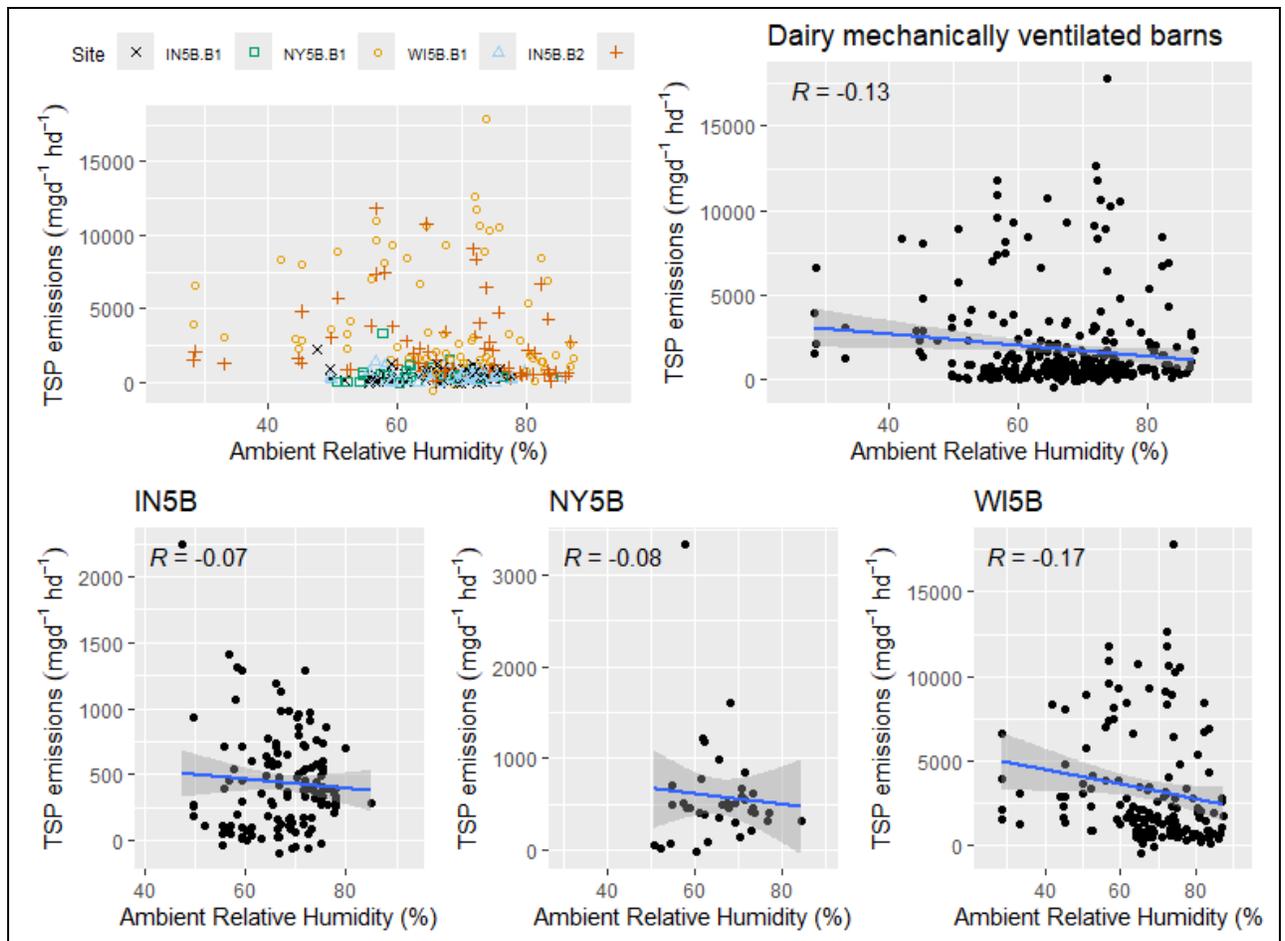


Figure 1.88: Scatter plot of dairy mechanically ventilated barns TSP emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

1.2.5.3 Air pressure

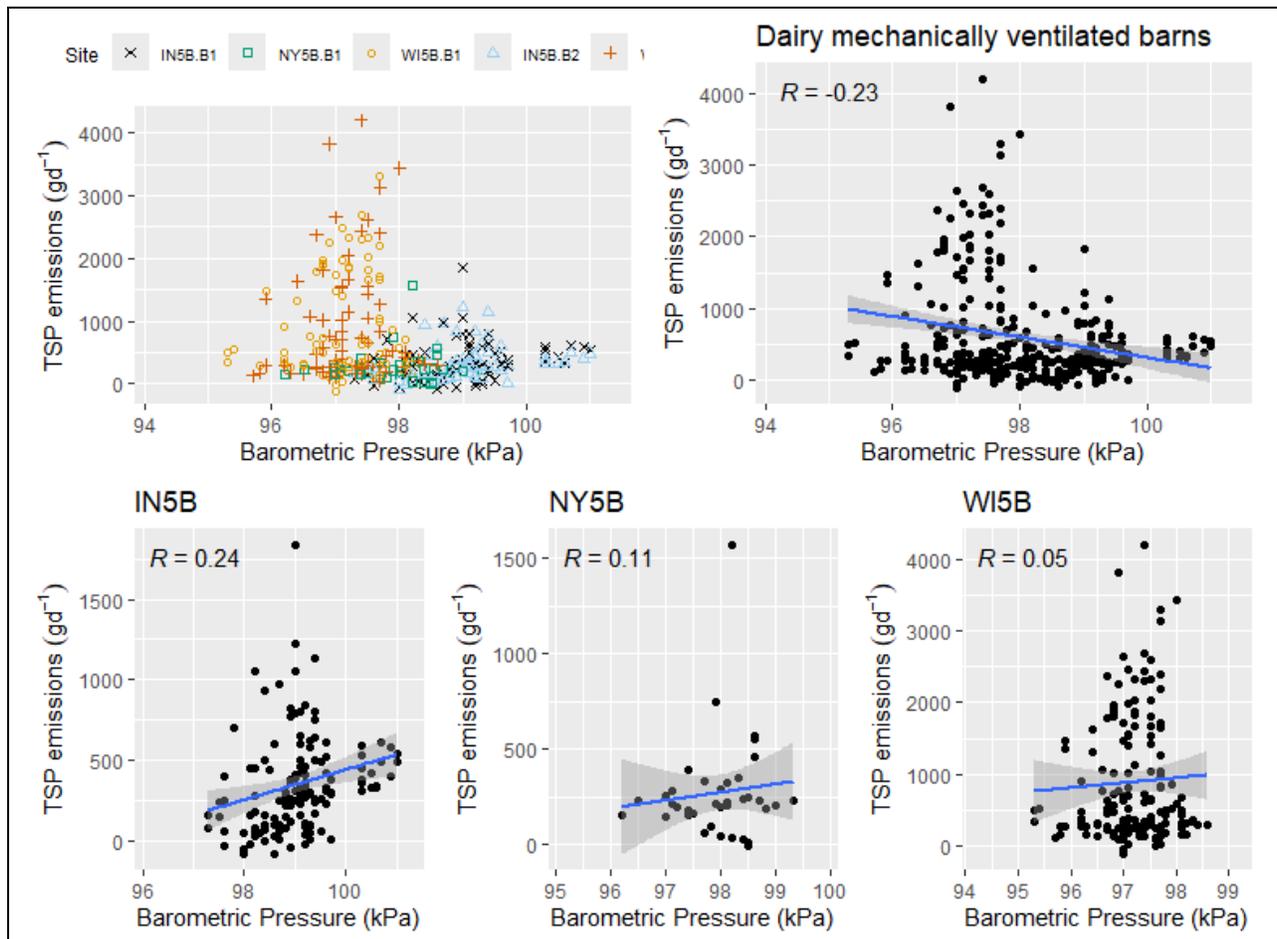


Figure 1.89: Scatter plot of dairy mechanically ventilated barns TSP emissions (g d^{-1}) versus air pressure.

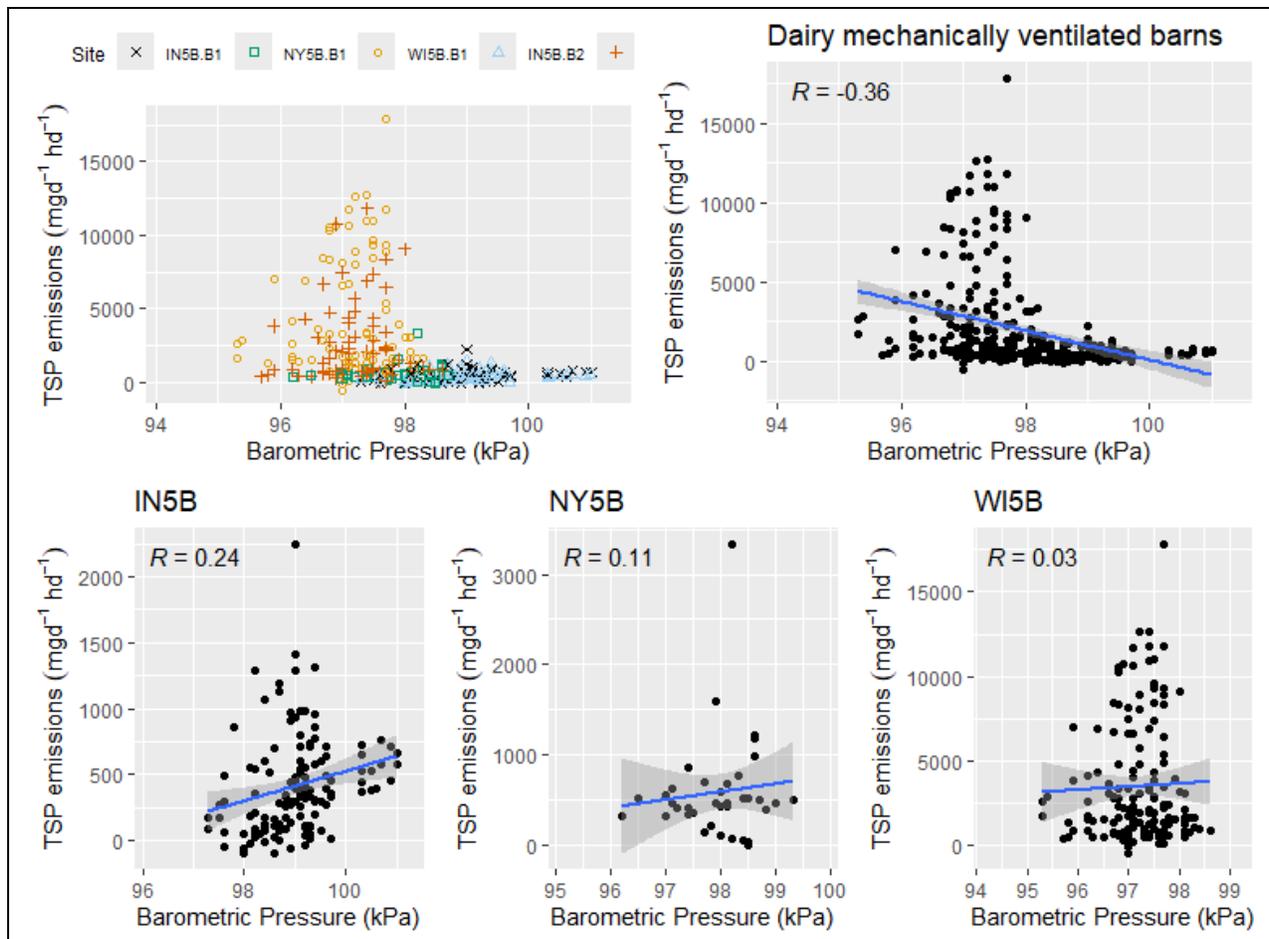


Figure 1.90: Scatter plot of dairy mechanically ventilated barns TSP emissions (mg d⁻¹hd⁻¹) versus air pressure.

2 Milking Centers

2.1 Environmental

Table 2.1: Summary of milking centers R² values for environmental parameters (kg d⁻¹)

Emission	Parameter	R	R2	Strength
NH ₃ (kgd ⁻¹)	Inventory (hd)	0.28	0.08	slight or weak
H ₂ S (gd ⁻¹)	Inventory (hd)	0.4	0.16	slight or weak
PM ₁₀ (gd ⁻¹)	Inventory (hd)	NA	NA	NA
PM _{2.5} (gd ⁻¹)	Inventory (hd)	NA	NA	NA
TSP (gd ⁻¹)	Inventory (hd)	NA	NA	NA
NH ₃ (gd ⁻¹ hd ⁻¹)	Inventory (hd)	-0.52	0.27	modest
H ₂ S (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	0.32	0.1	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	NA	NA	NA
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	NA	NA	NA
TSP (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	NA	NA	NA
NH ₃ (kgd ⁻¹)	Average weight (kg)	-0.28	0.08	slight or weak
H ₂ S (gd ⁻¹)	Average weight (kg)	-0.4	0.16	slight or weak
PM ₁₀ (gd ⁻¹)	Average weight (kg)	0	0	slight or weak
PM _{2.5} (gd ⁻¹)	Average weight (kg)	-0.16	0.03	slight or weak
TSP (gd ⁻¹)	Average weight (kg)	0.18	0.03	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Average weight (kg)	0.52	0.27	modest
H ₂ S (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	-0.32	0.1	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	0	0	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	-0.16	0.03	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	0.18	0.03	slight or weak
NH ₃ (kgd ⁻¹)	Live animal weight (kg)	-0.28	0.08	slight or weak
H ₂ S (gd ⁻¹)	Live animal weight (kg)	-0.4	0.16	slight or weak
PM ₁₀ (gd ⁻¹)	Live animal weight (kg)	0	0	slight or weak
PM _{2.5} (gd ⁻¹)	Live animal weight (kg)	-0.16	0.03	slight or weak
TSP (gd ⁻¹)	Live animal weight (kg)	0.18	0.03	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0.52	0.27	modest
H ₂ S (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	-0.32	0.1	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0	0	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	-0.16	0.03	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0.18	0.03	slight or weak
NH ₃ (kgd ⁻¹)	Exhaust Temperature (°C)	0.52	0.27	modest
H ₂ S (gd ⁻¹)	Exhaust Temperature (°C)	0.33	0.11	slight or weak
PM ₁₀ (gd ⁻¹)	Exhaust Temperature (°C)	0.55	0.31	modest
PM _{2.5} (gd ⁻¹)	Exhaust Temperature (°C)	0.4	0.16	slight or weak
TSP (gd ⁻¹)	Exhaust Temperature (°C)	0.47	0.22	modest
NH ₃ (gd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.35	0.12	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.36	0.13	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.55	0.31	modest
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.4	0.16	slight or weak

TSP (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.47	0.22	modest
NH ₃ (kgd ⁻¹)	Exhaust Relative humidity (%)	0.38	0.15	slight or weak
H ₂ S (gd ⁻¹)	Exhaust Relative humidity (%)	0.34	0.11	slight or weak
PM ₁₀ (gd ⁻¹)	Exhaust Relative humidity (%)	-0.46	0.21	modest
PM _{2.5} (gd ⁻¹)	Exhaust Relative humidity (%)	-0.01	0	slight or weak
TSP (gd ⁻¹)	Exhaust Relative humidity (%)	-0.01	0	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	0.3	0.09	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	0.33	0.11	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.46	0.21	modest
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.01	0	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.01	0	slight or weak
NH ₃ (kgd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.44	0.19	slight or weak
H ₂ S (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.5	0.25	modest
PM ₁₀ (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.56	0.31	modest
PM _{2.5} (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.38	0.14	slight or weak
TSP (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.48	0.23	modest
NH ₃ (gd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	-0.35	0.12	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.46	0.21	modest
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.56	0.31	modest
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.38	0.14	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.48	0.23	modest

2.1.1 Ammonia (NH₃)

2.1.1.1 Inventory

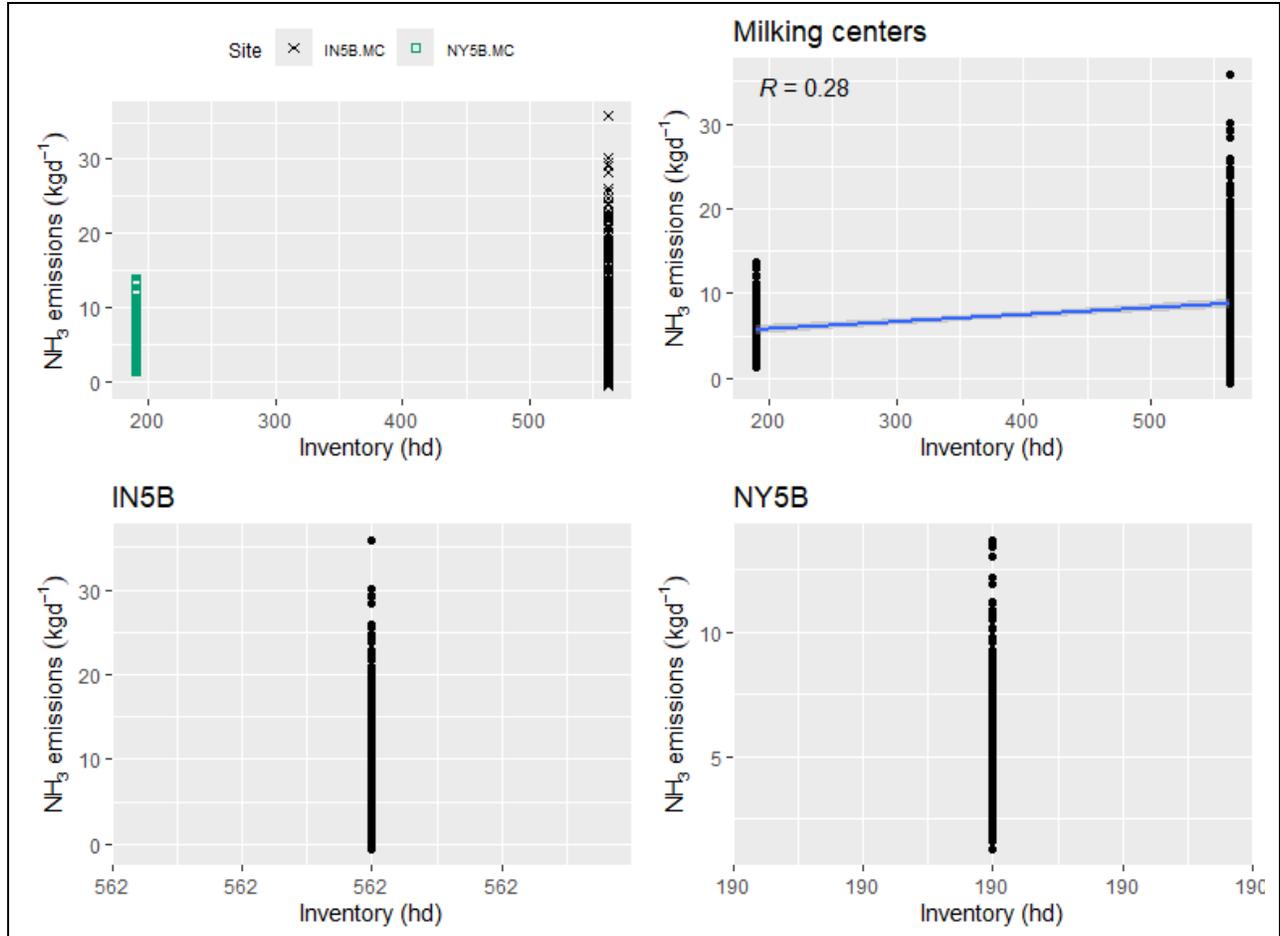


Figure 2.1: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus Inventory.

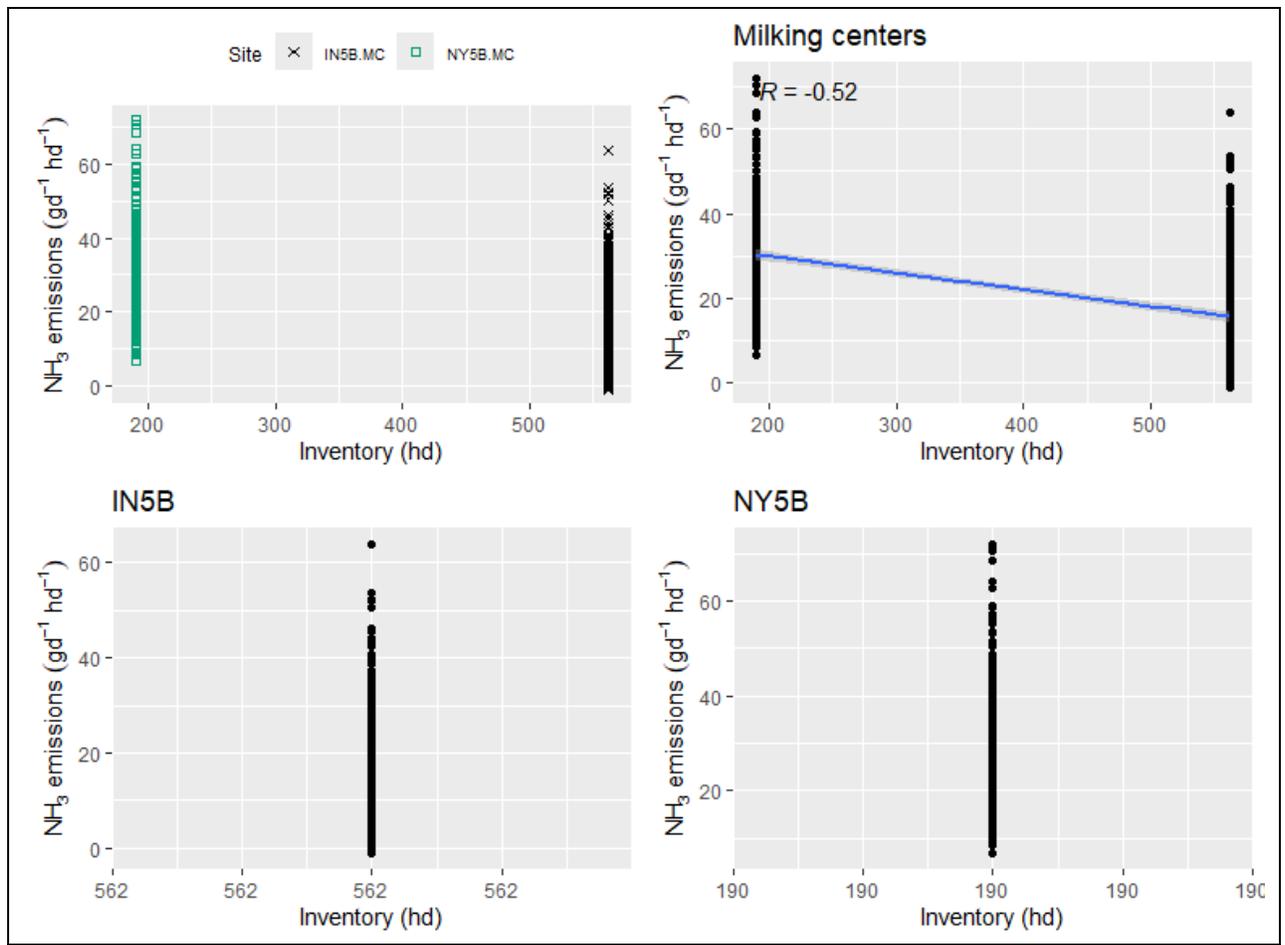


Figure 2.2: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus Inventory.

2.1.1.2 Average animal weight

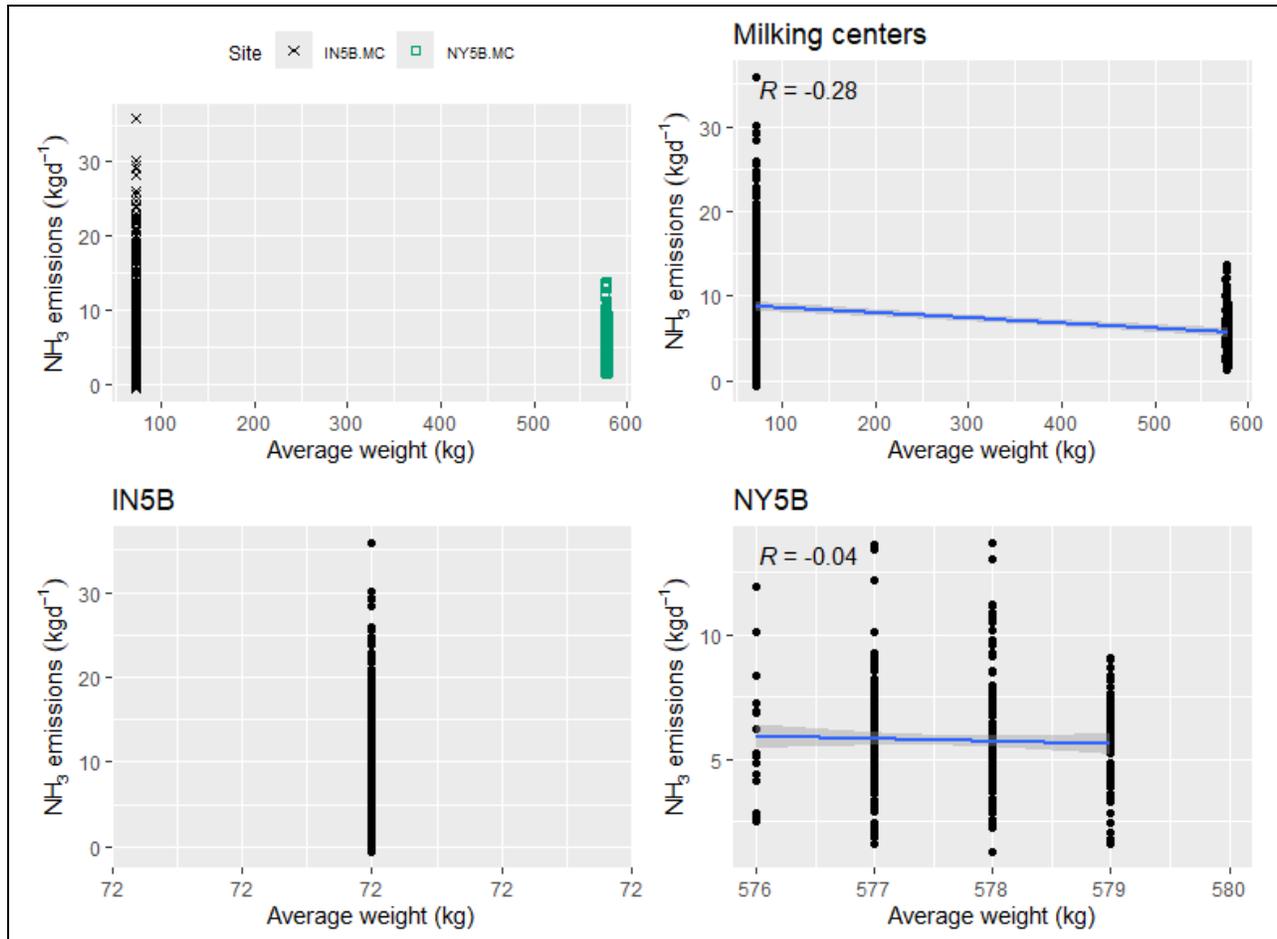


Figure 2.3: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus average animal weight.

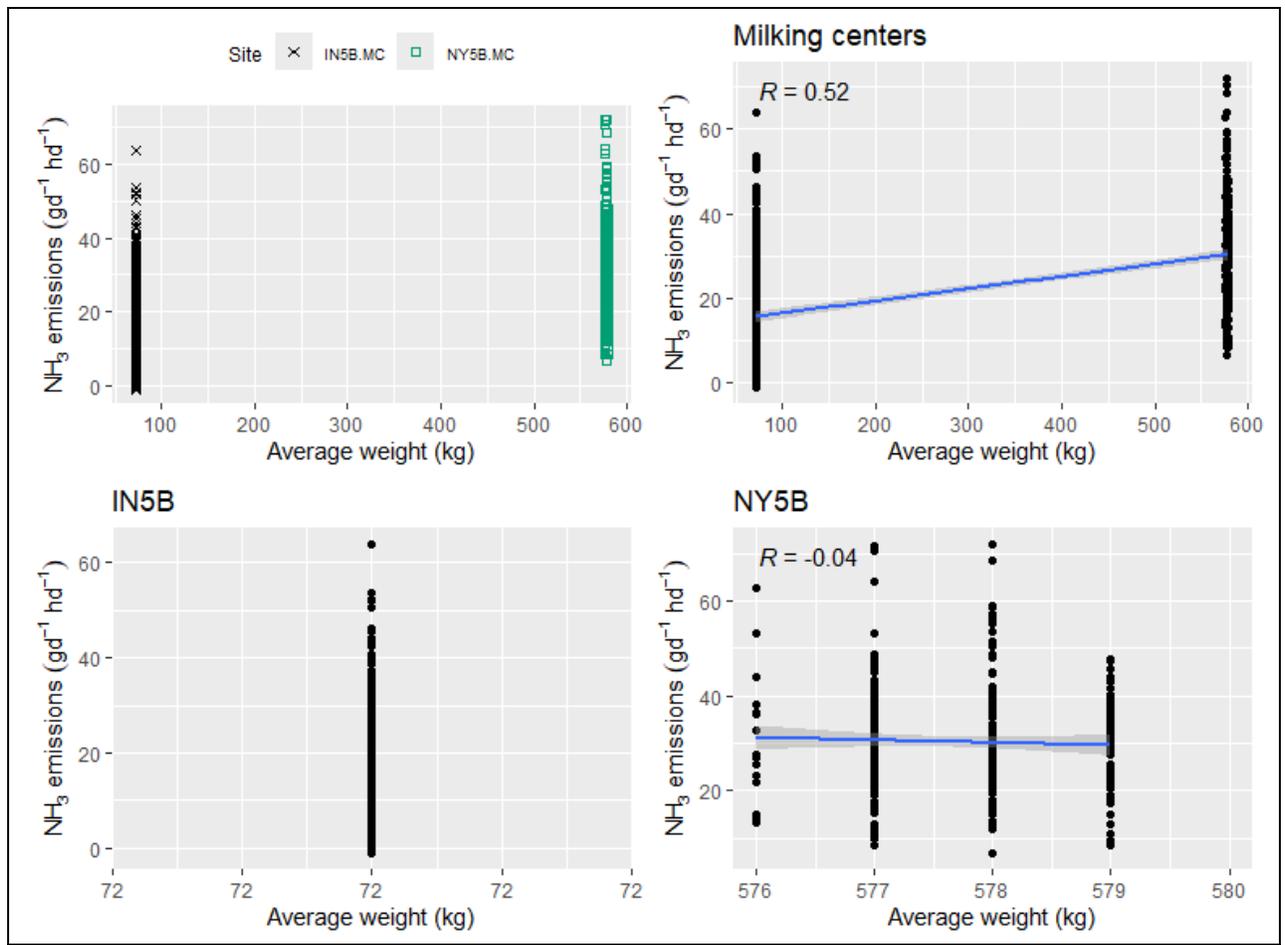


Figure 2.4: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus average animal weight.

2.1.1.3 Live animal weight

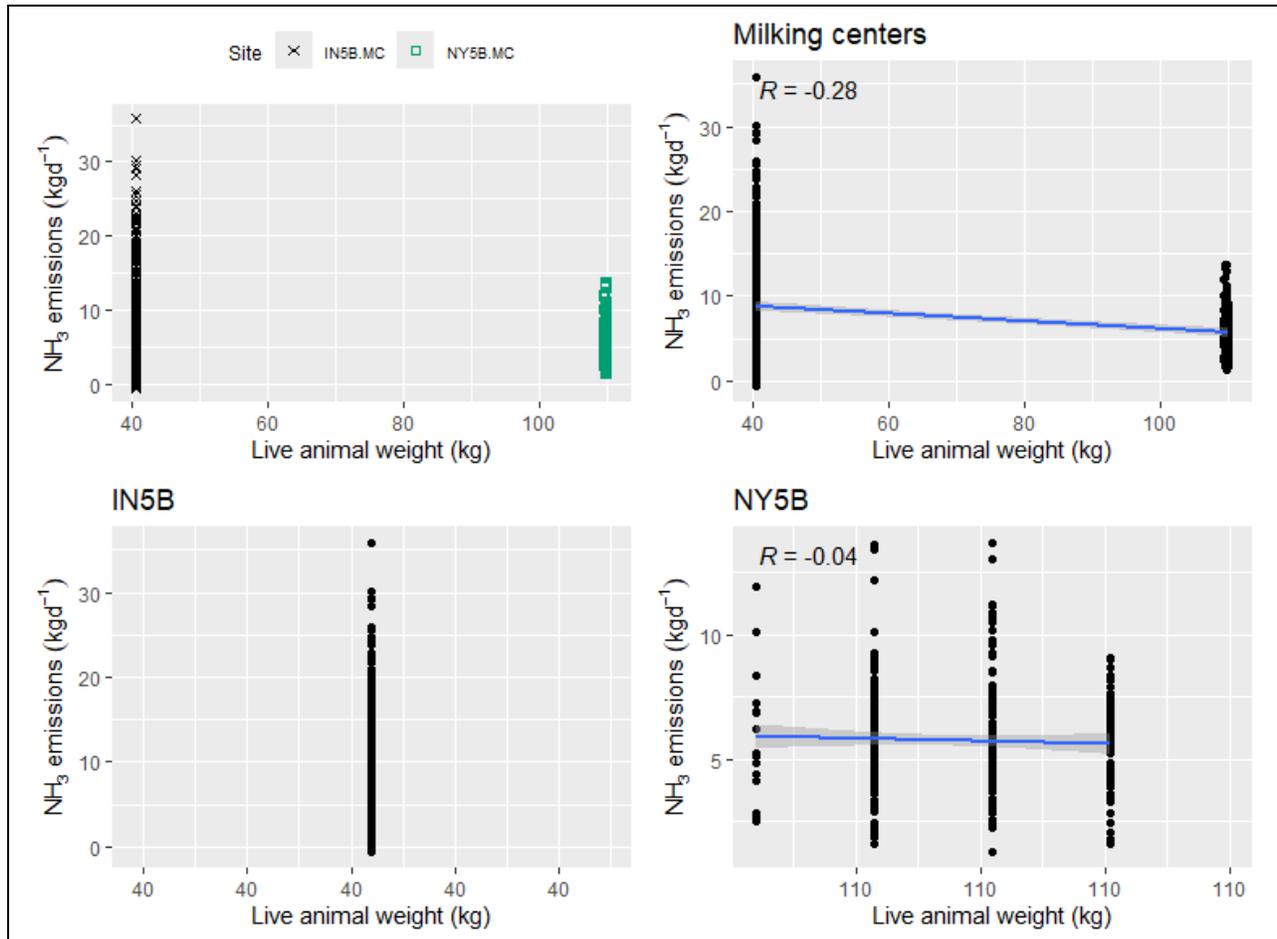


Figure 2.5: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus live animal weight.

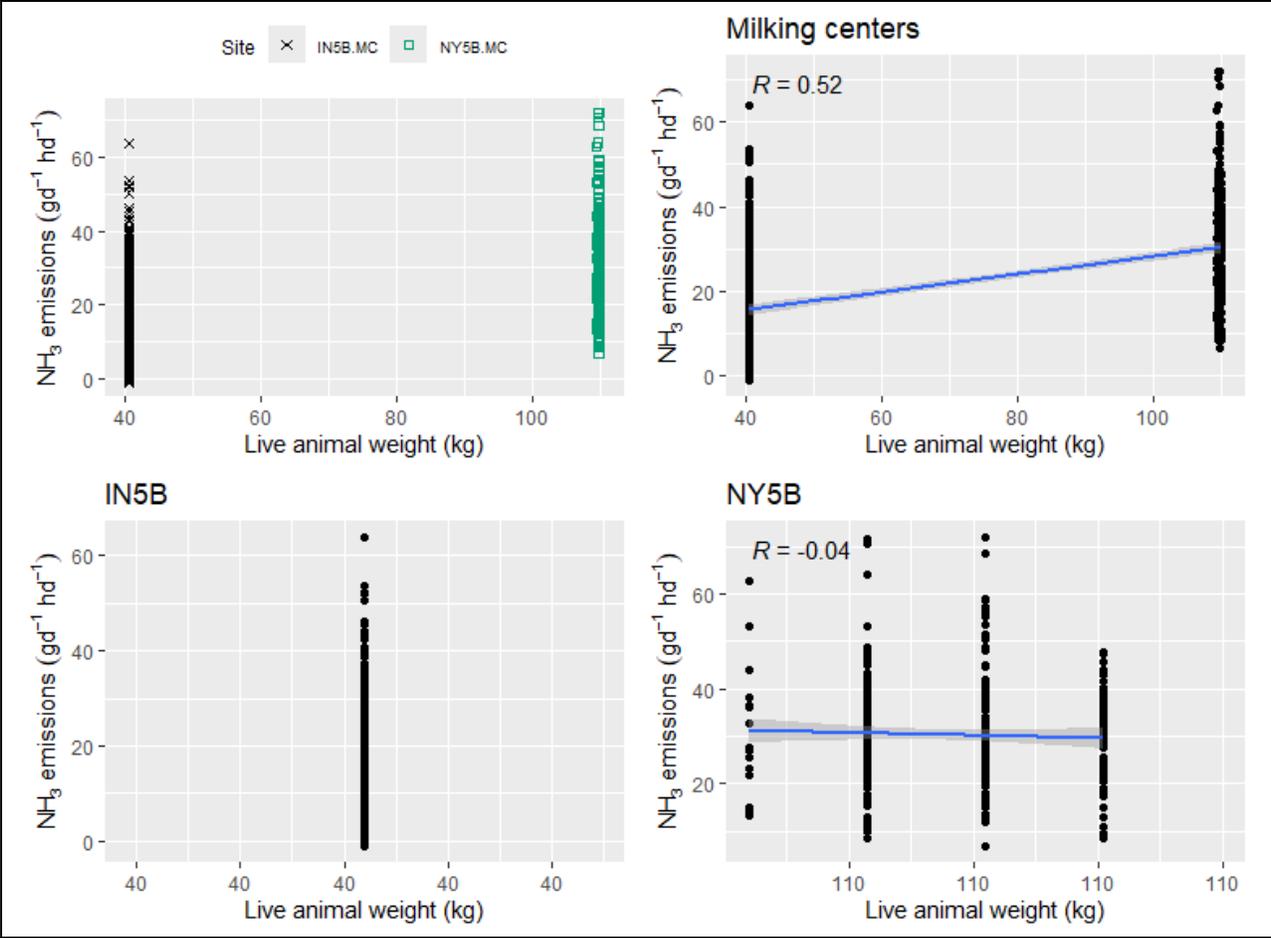


Figure 2.6: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus live animal weight.

2.1.1.4 Exhaust temperature

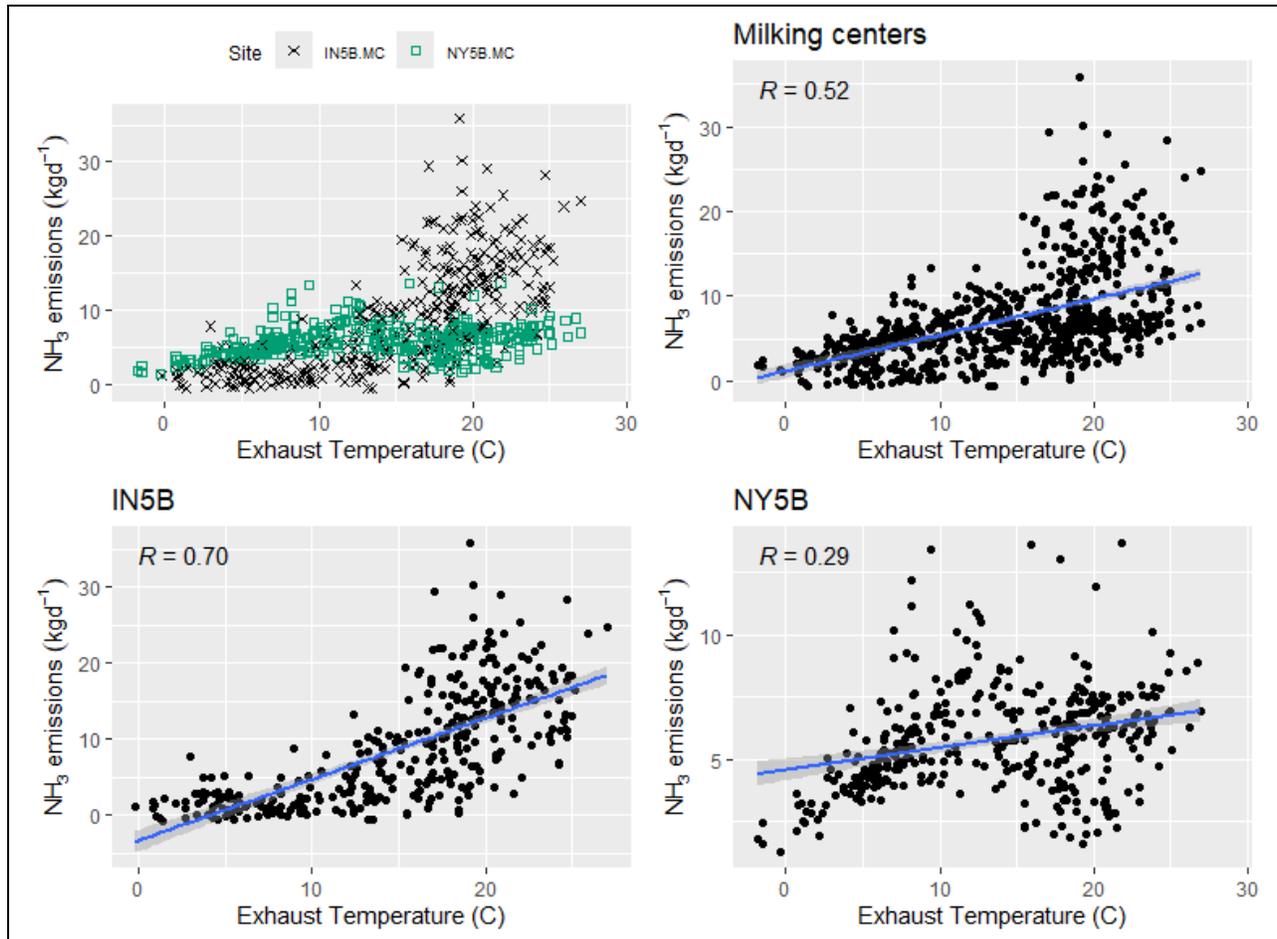


Figure 2.7: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus exhaust temperature.

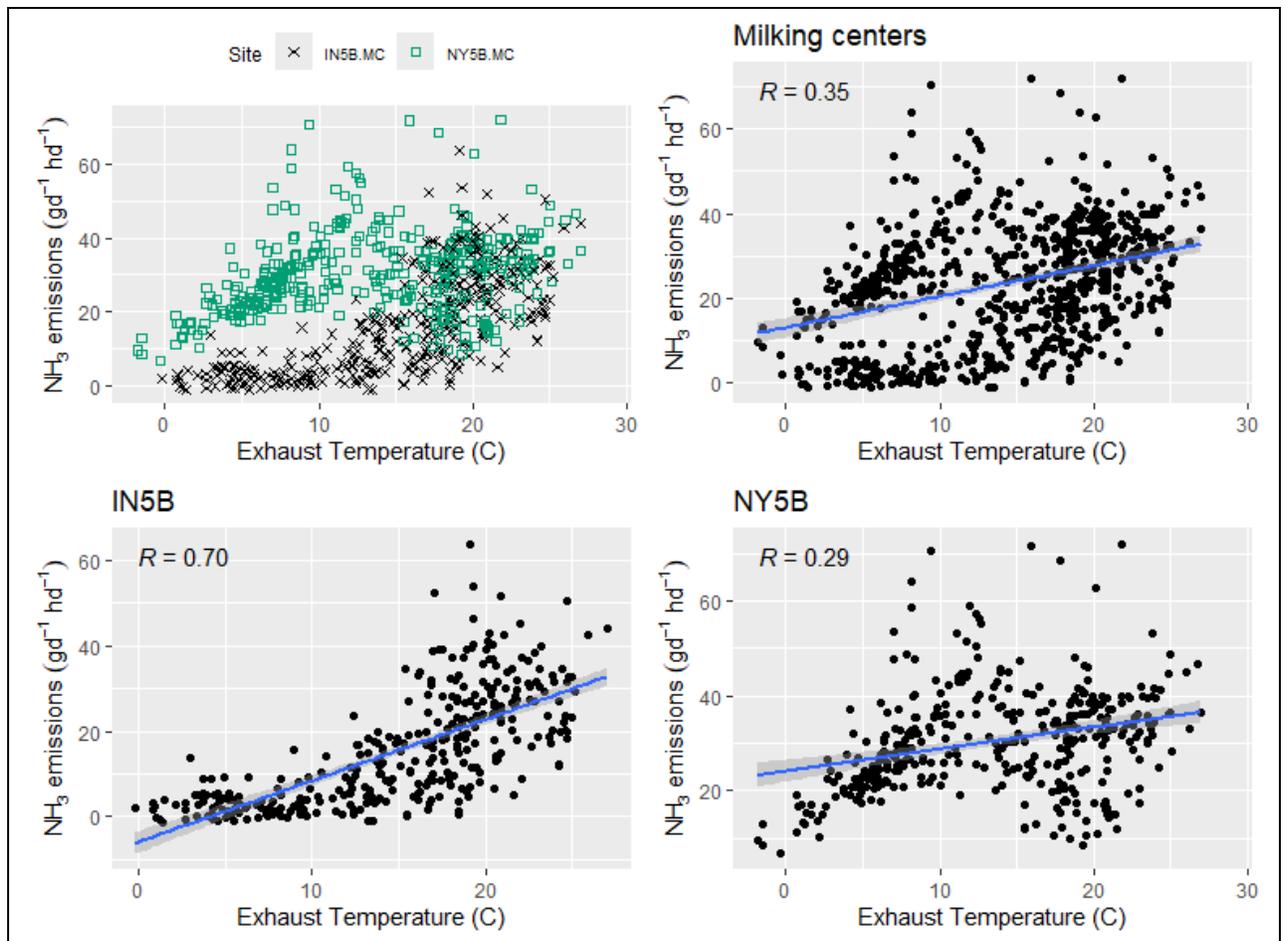


Figure 2.8: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus exhaust temperature.

2.1.1.5 Exhaust relative humidity

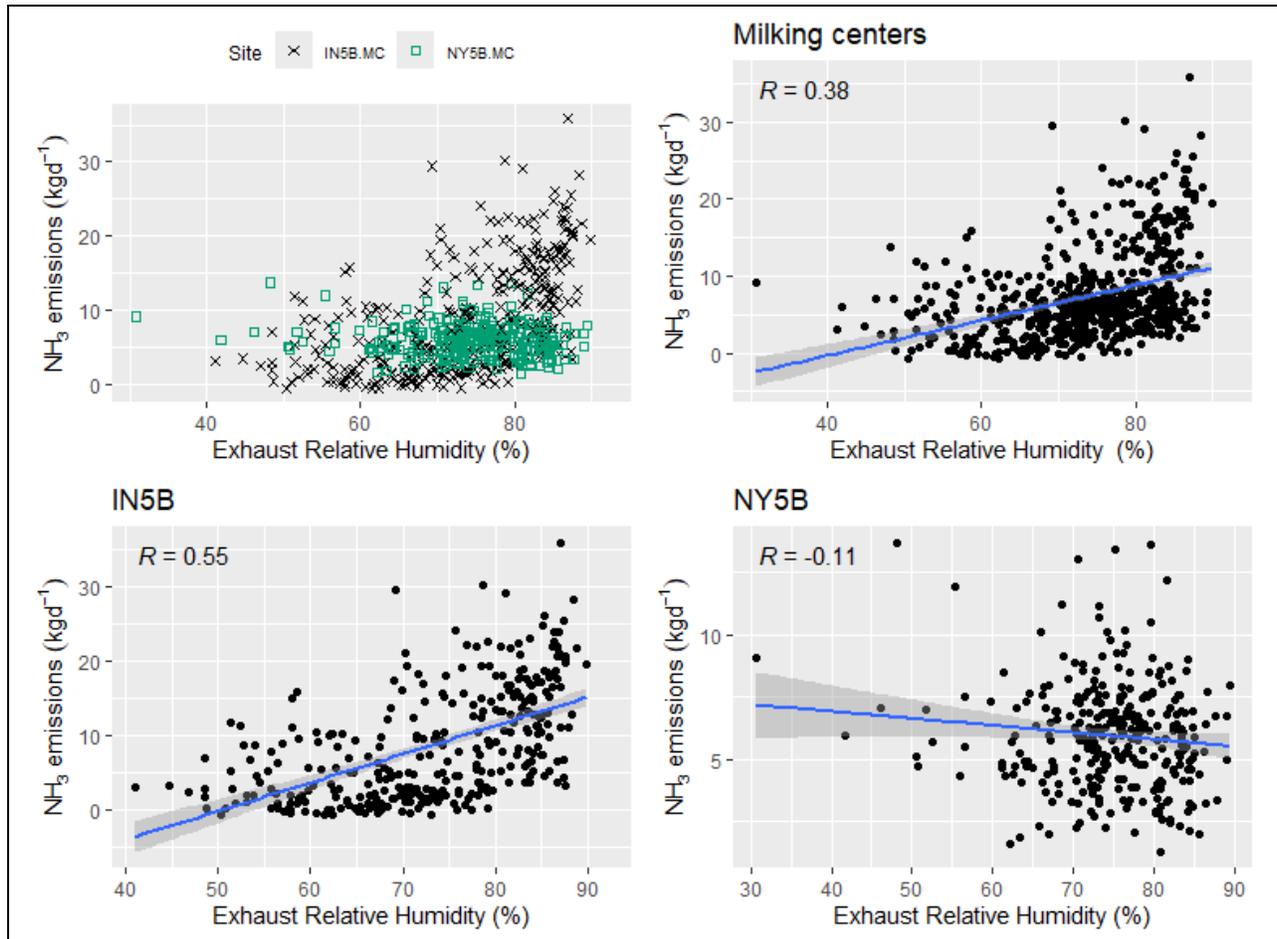


Figure 2.9: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus exhaust relative humidity.

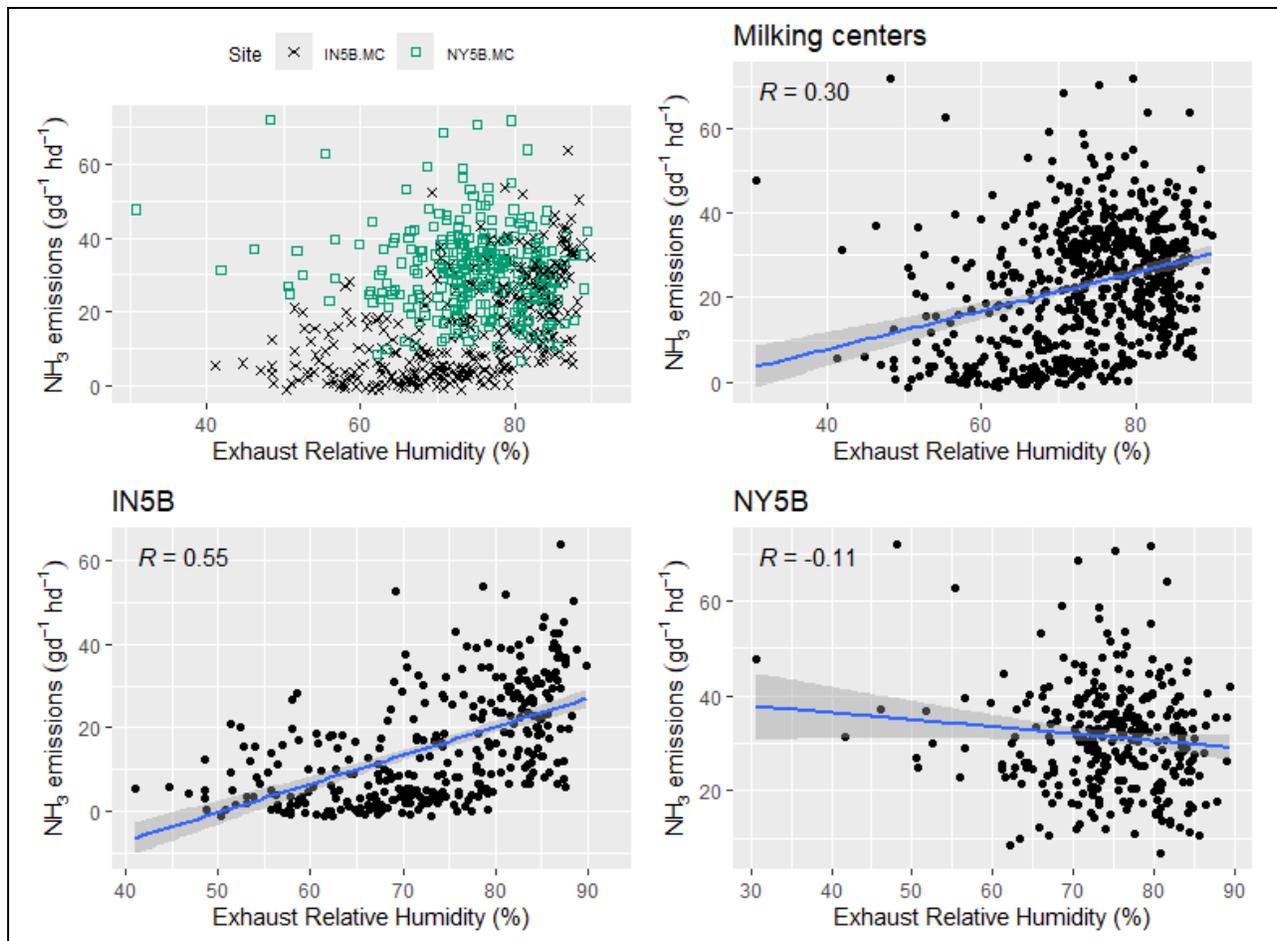


Figure 2.10: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus exhaust relative humidity.

2.1.1.6 Airflow

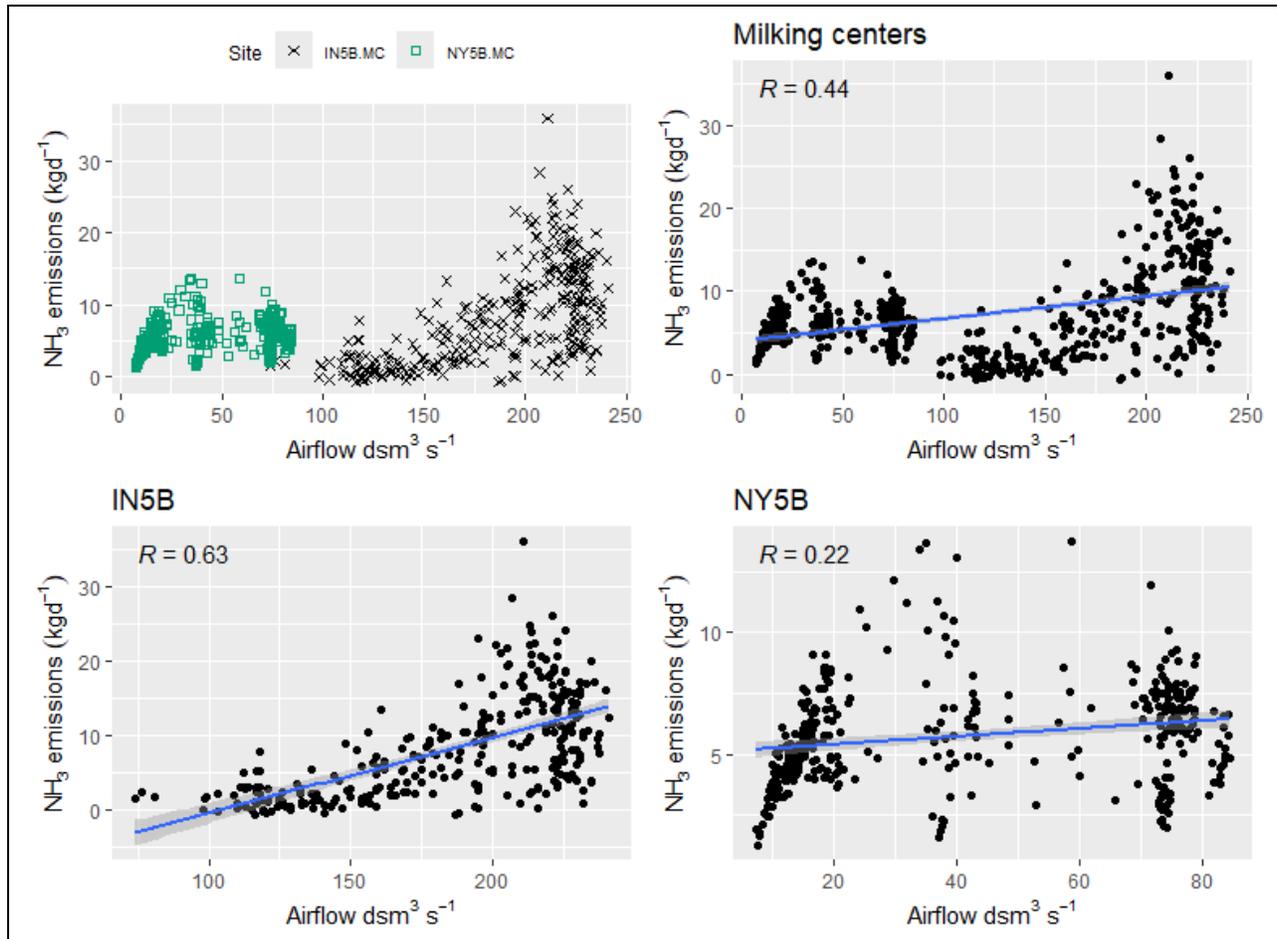


Figure 2.11: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus airflow.

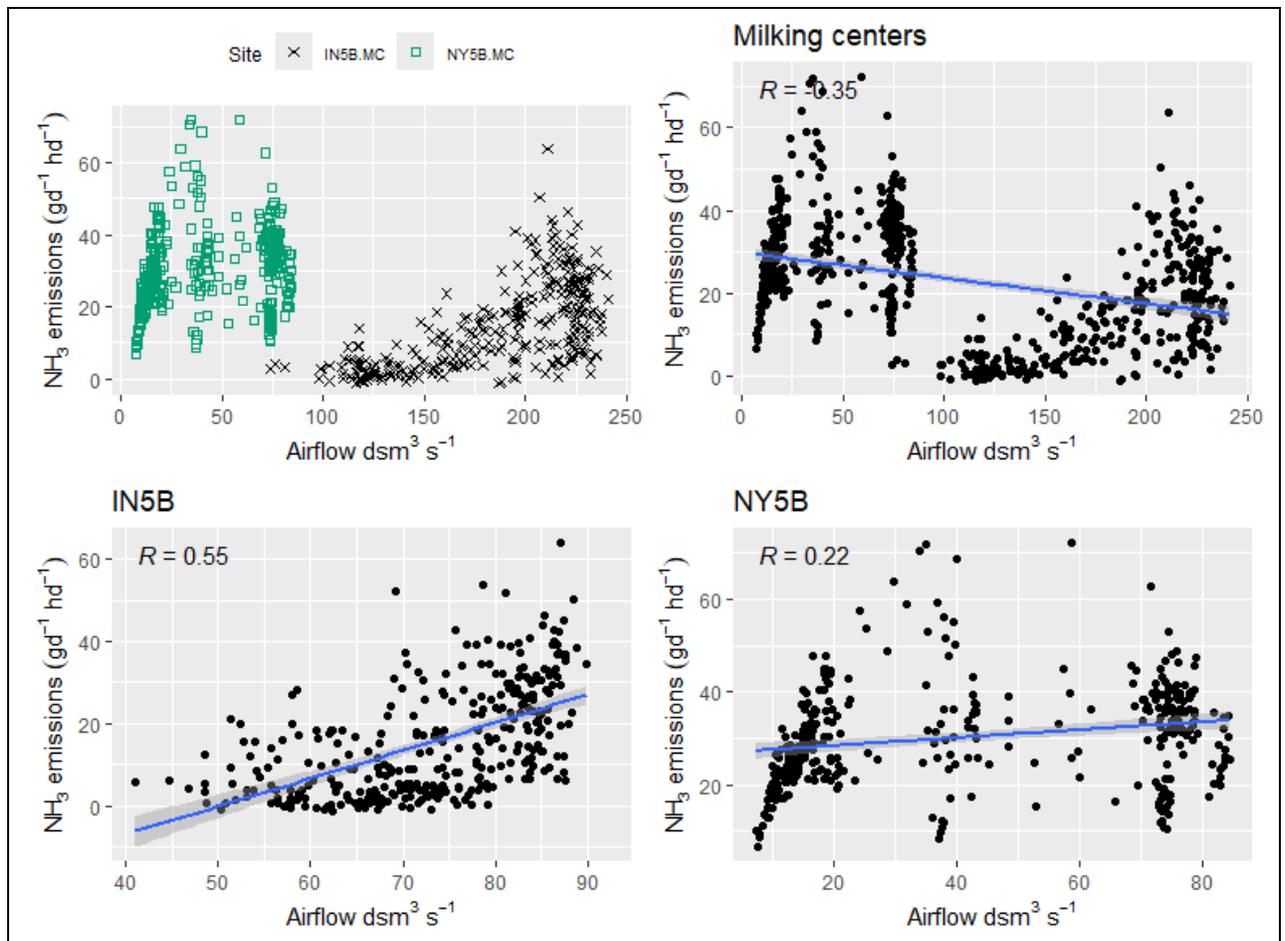


Figure 2.12: Scatter plot of milking centers NH_3 emissions ($\text{g d}^{-1}\text{hd}^{-1}$) versus airflow.

2.1.2 Hydrogen Sulfide (H₂S)

2.1.2.1 Inventory

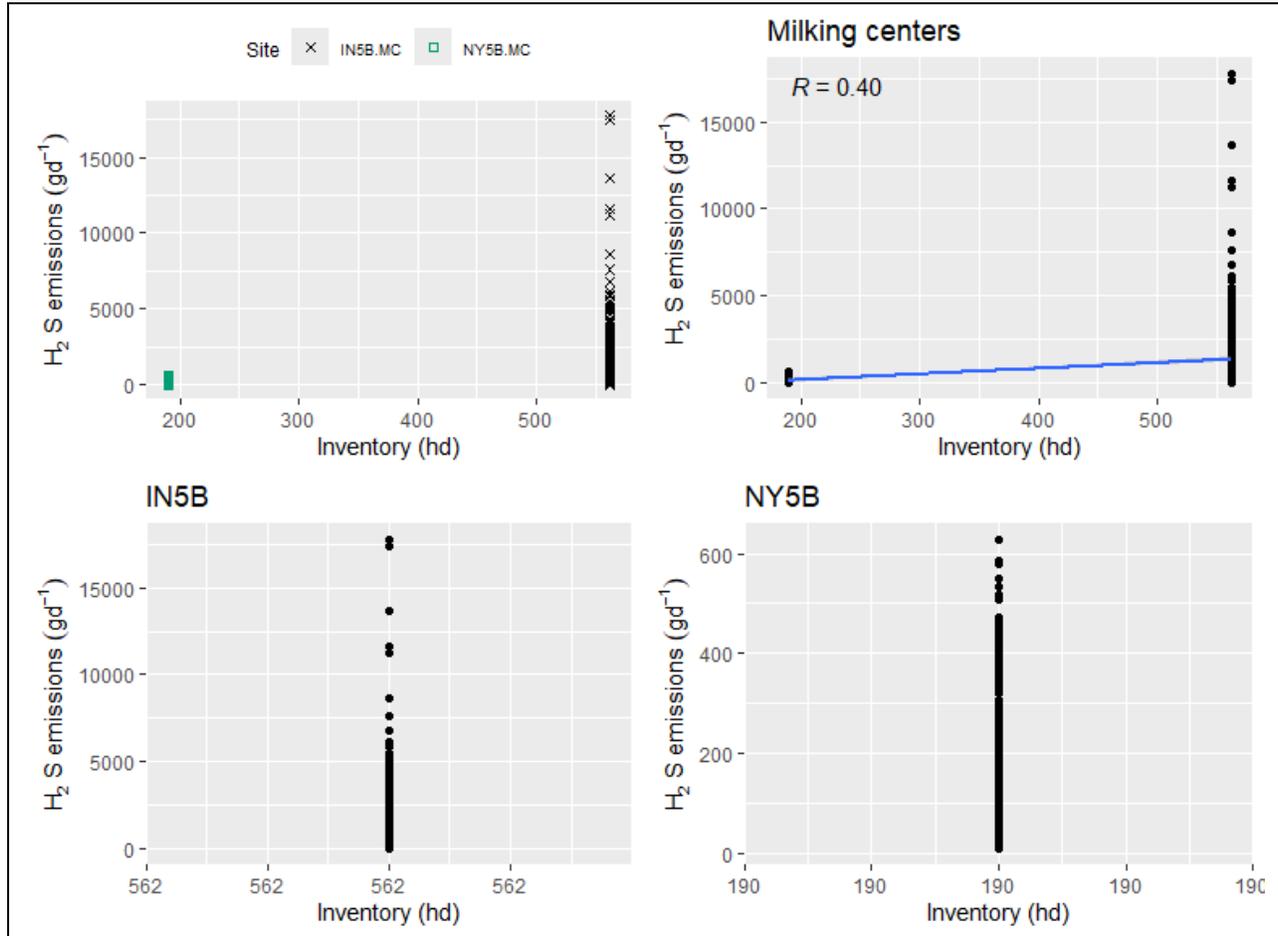


Figure 2.13: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus Inventory.

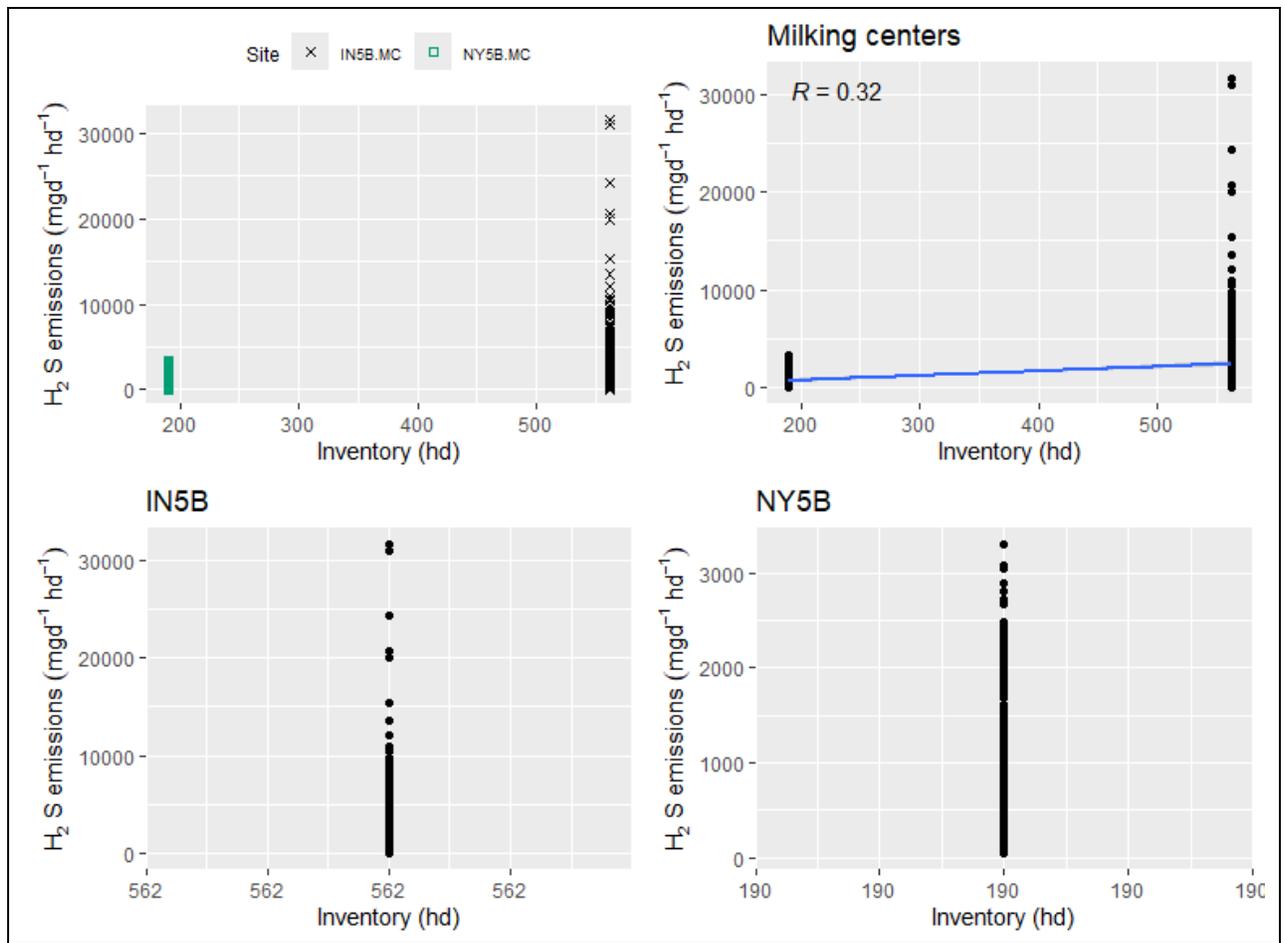


Figure 2.14: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus Inventory.

2.1.2.2 Average animal weight

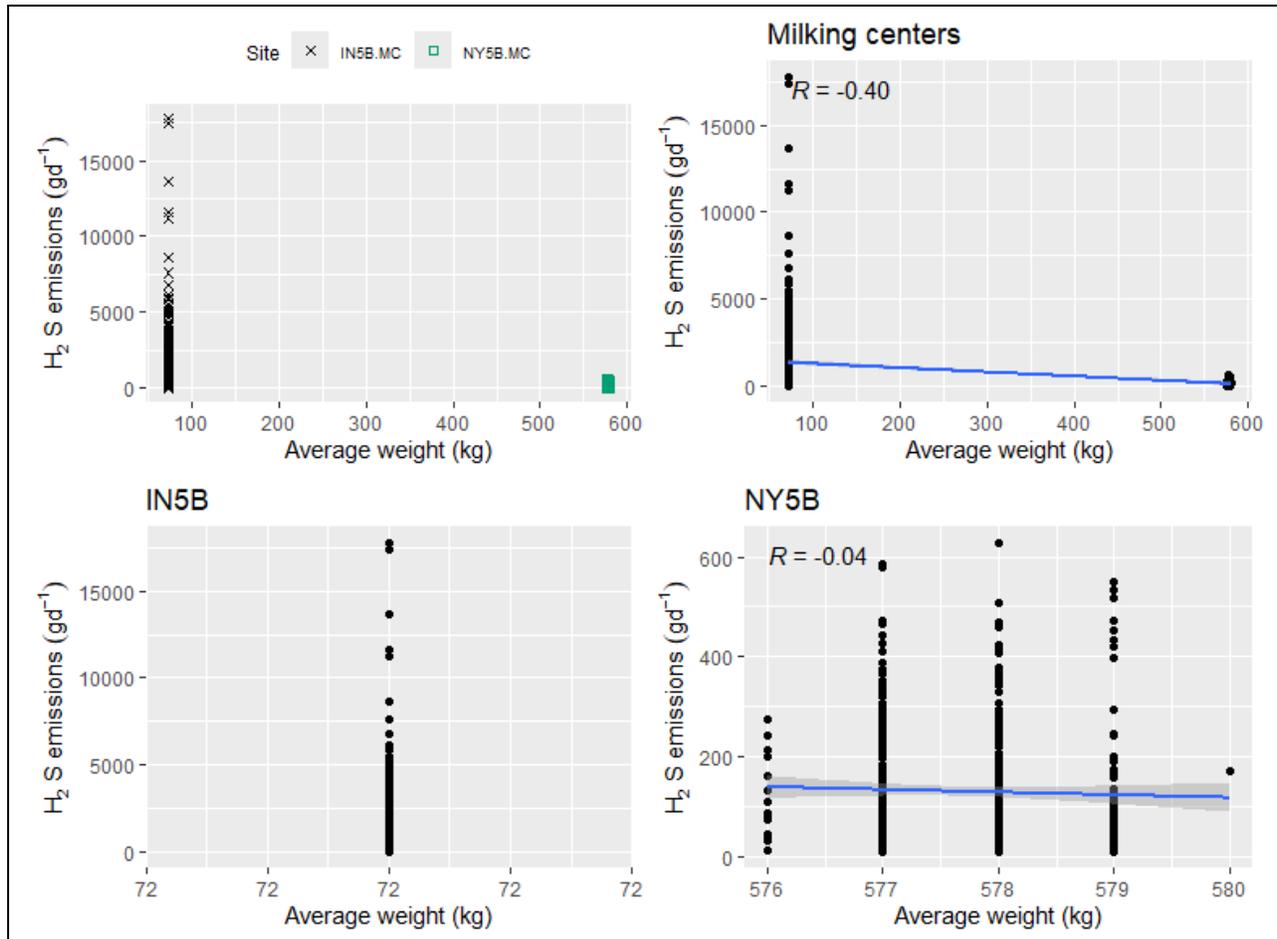


Figure 2.15: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus average animal weight.

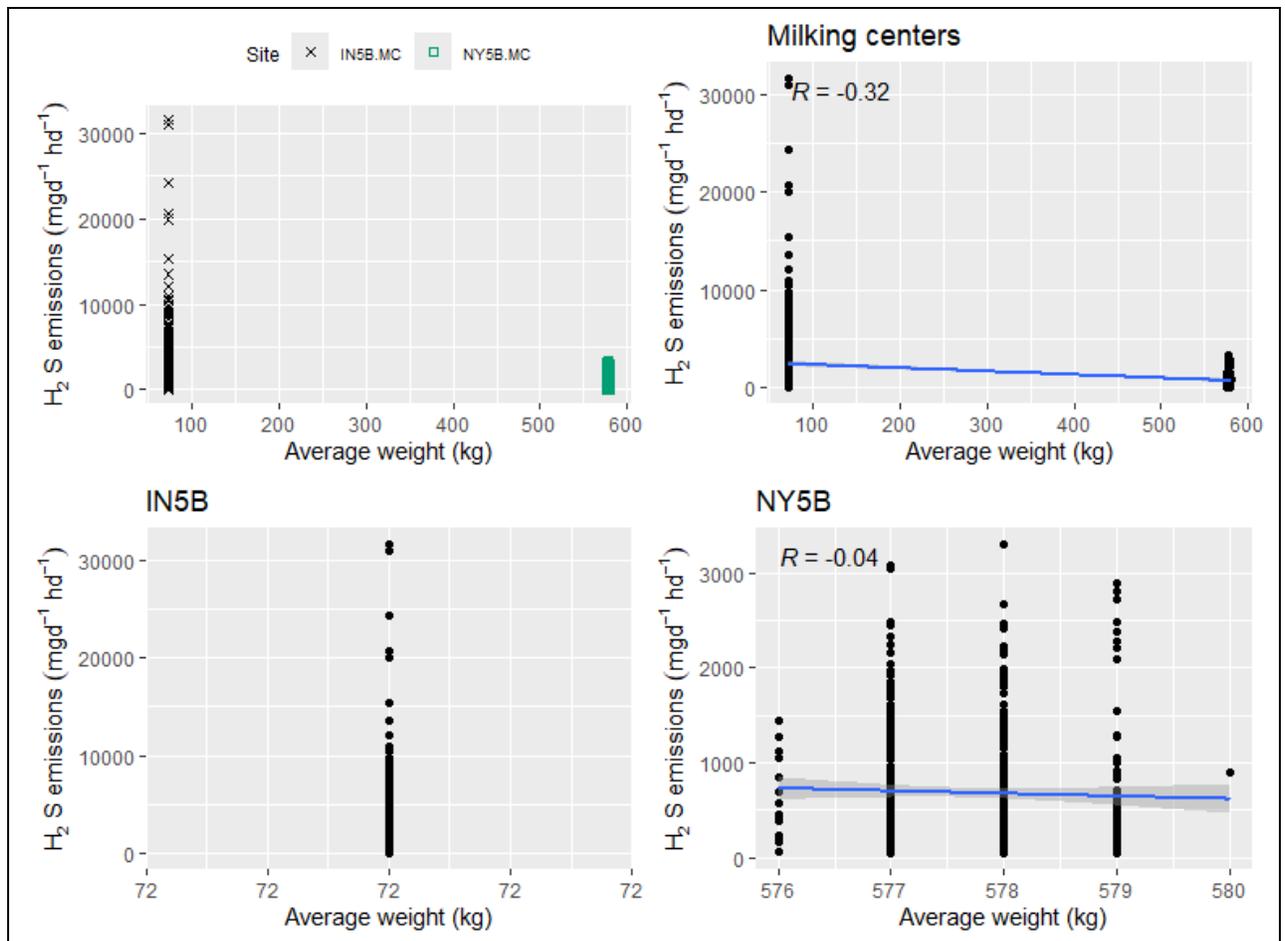


Figure 2.16: Scatter plot of milking centers H_2S emissions ($mg d^{-1}hd^{-1}$) versus average animal weight.

2.1.2.3 Live animal weight

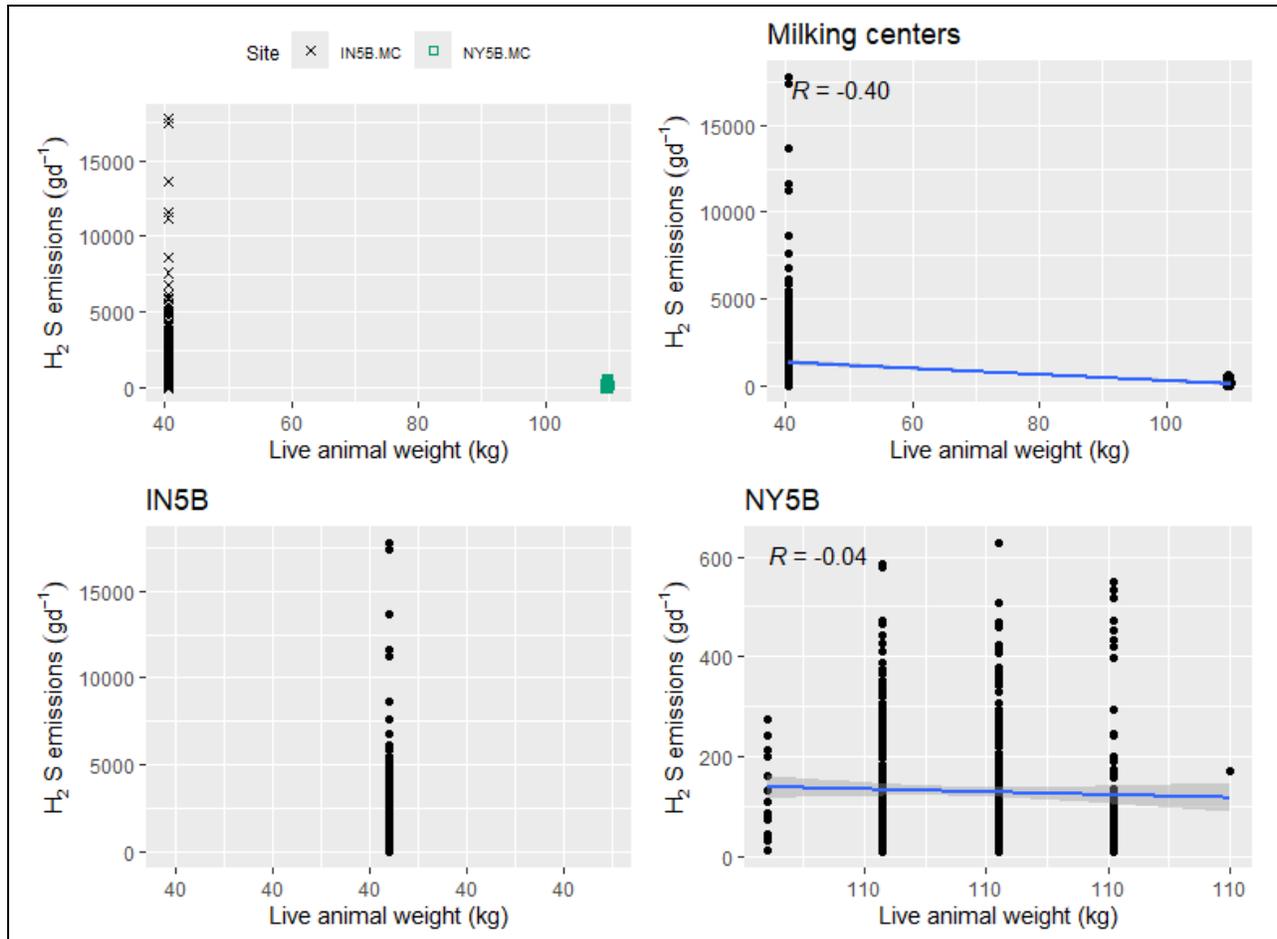


Figure 2.17: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus live animal weight.

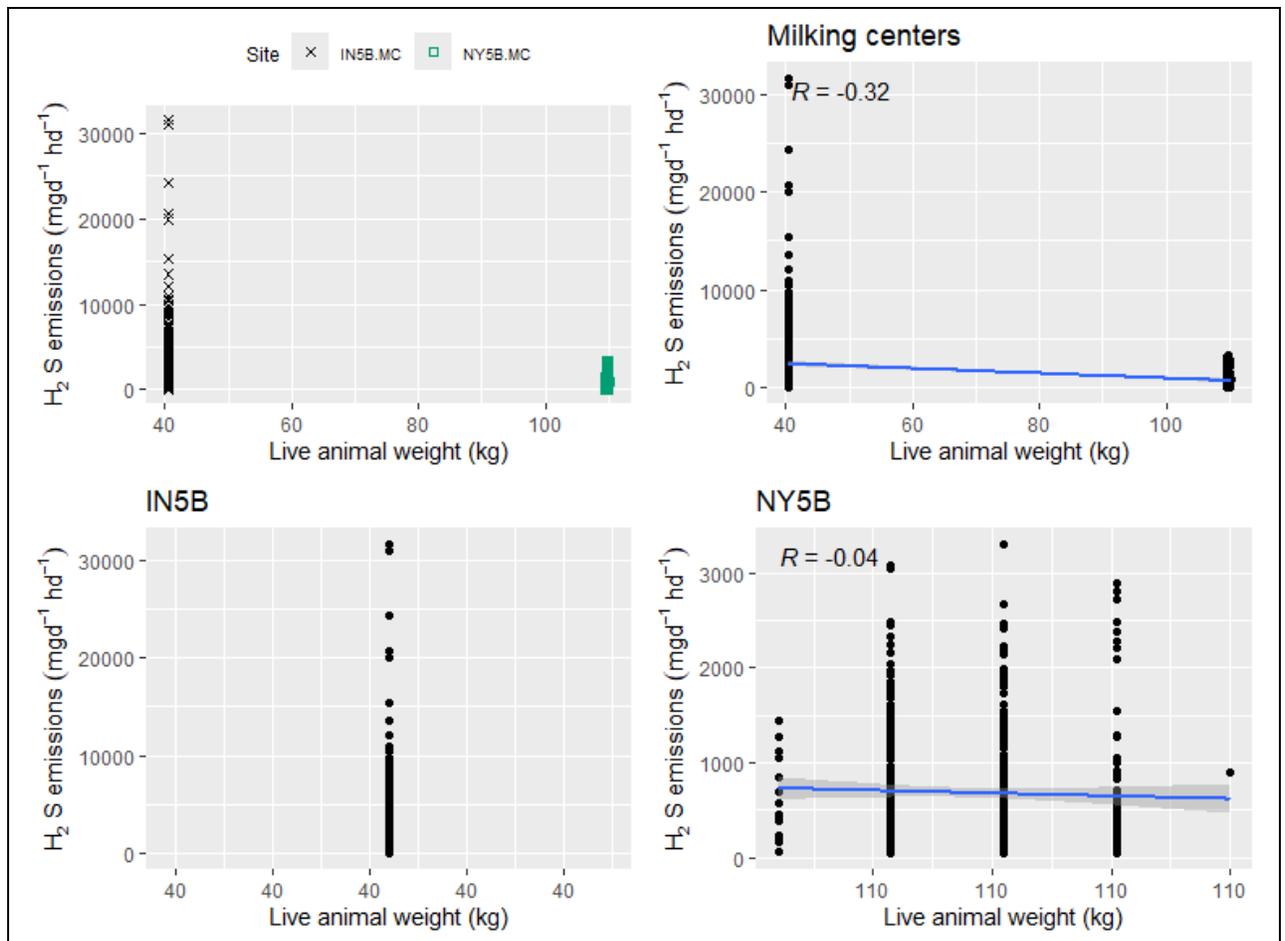


Figure 2.18: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus live animal weight.

2.1.2.4 Exhaust temperature

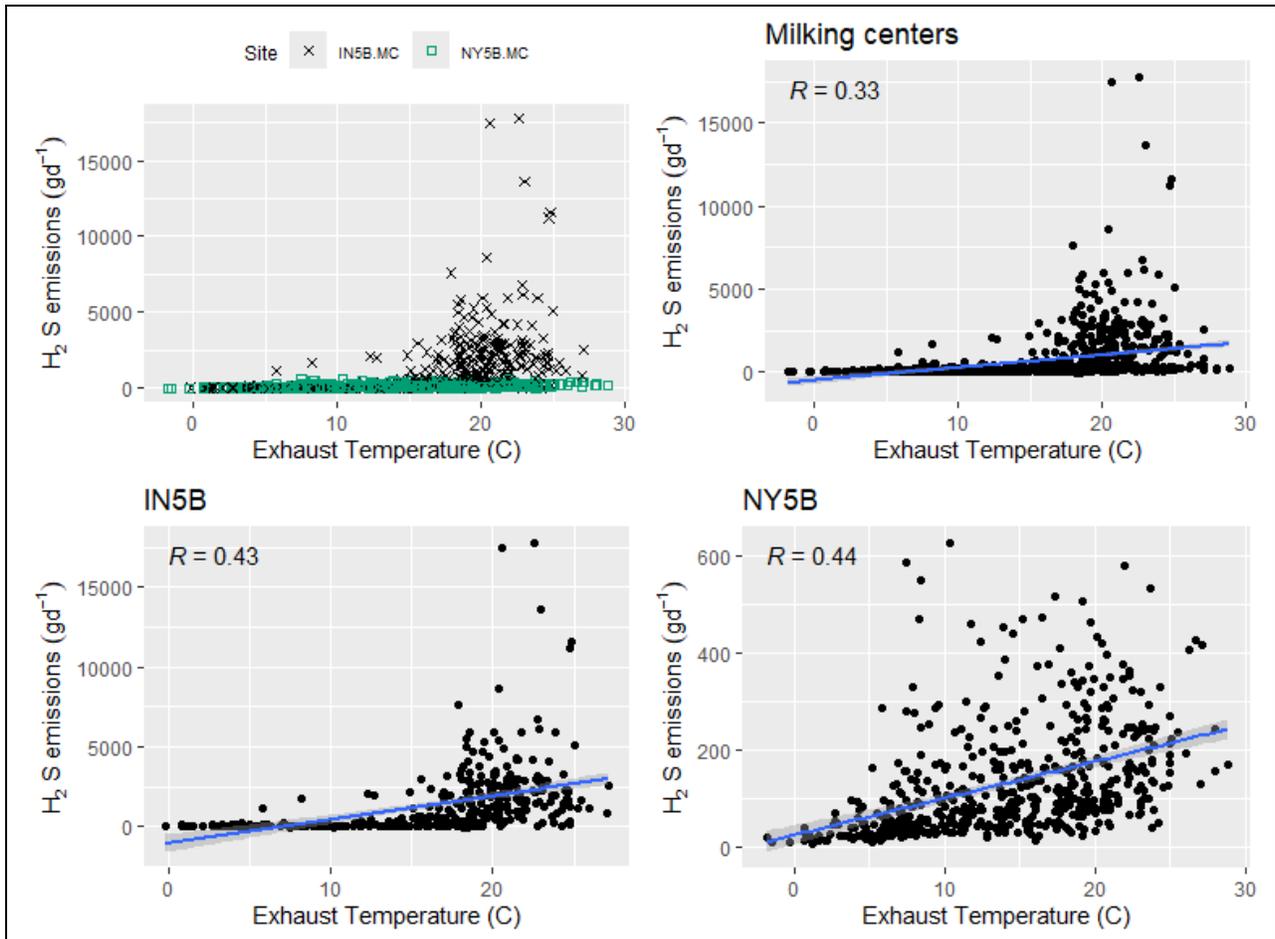


Figure 2.19: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus exhaust temperature.

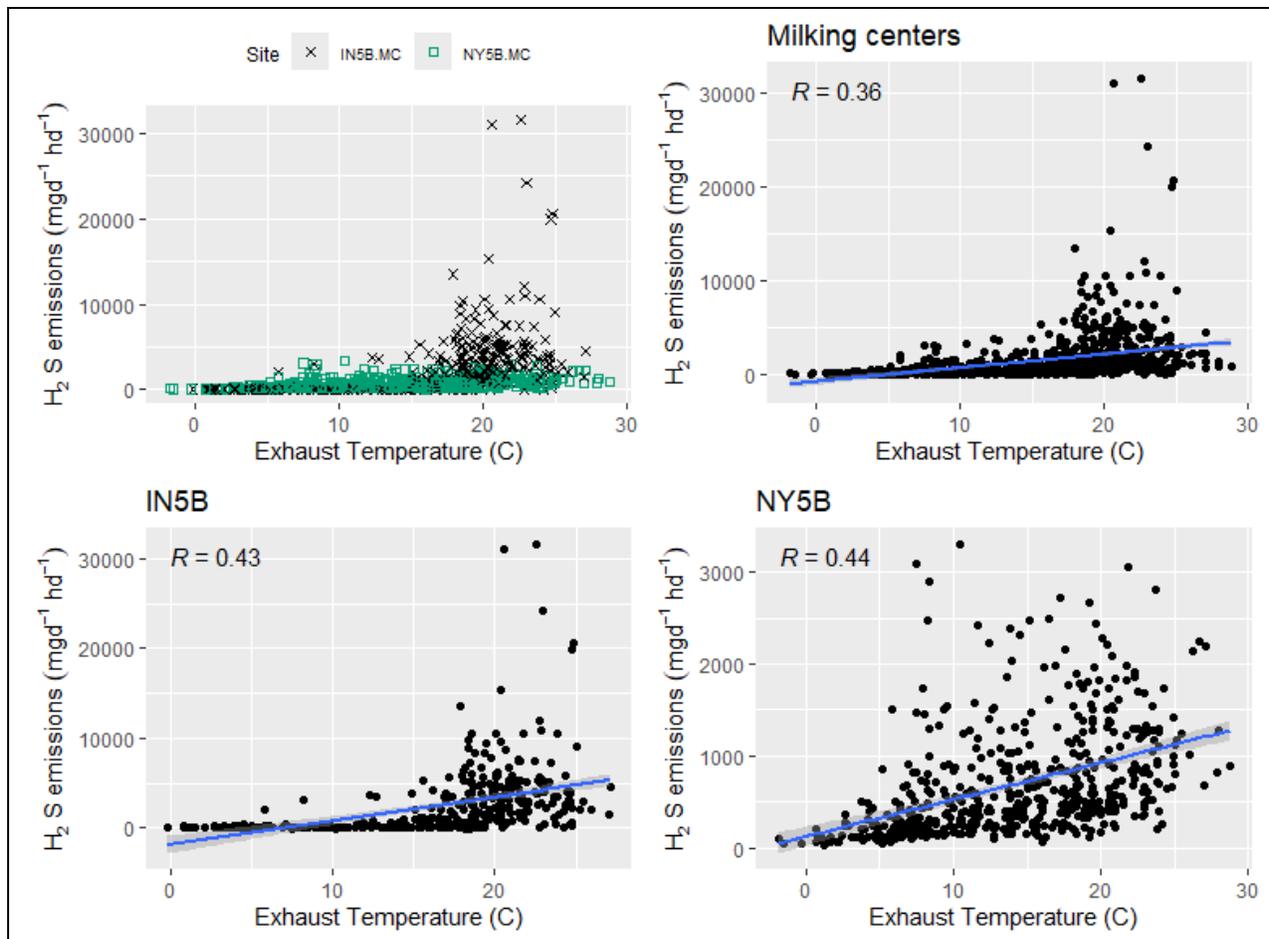


Figure 2.20: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

2.1.2.5 Exhaust relative humidity

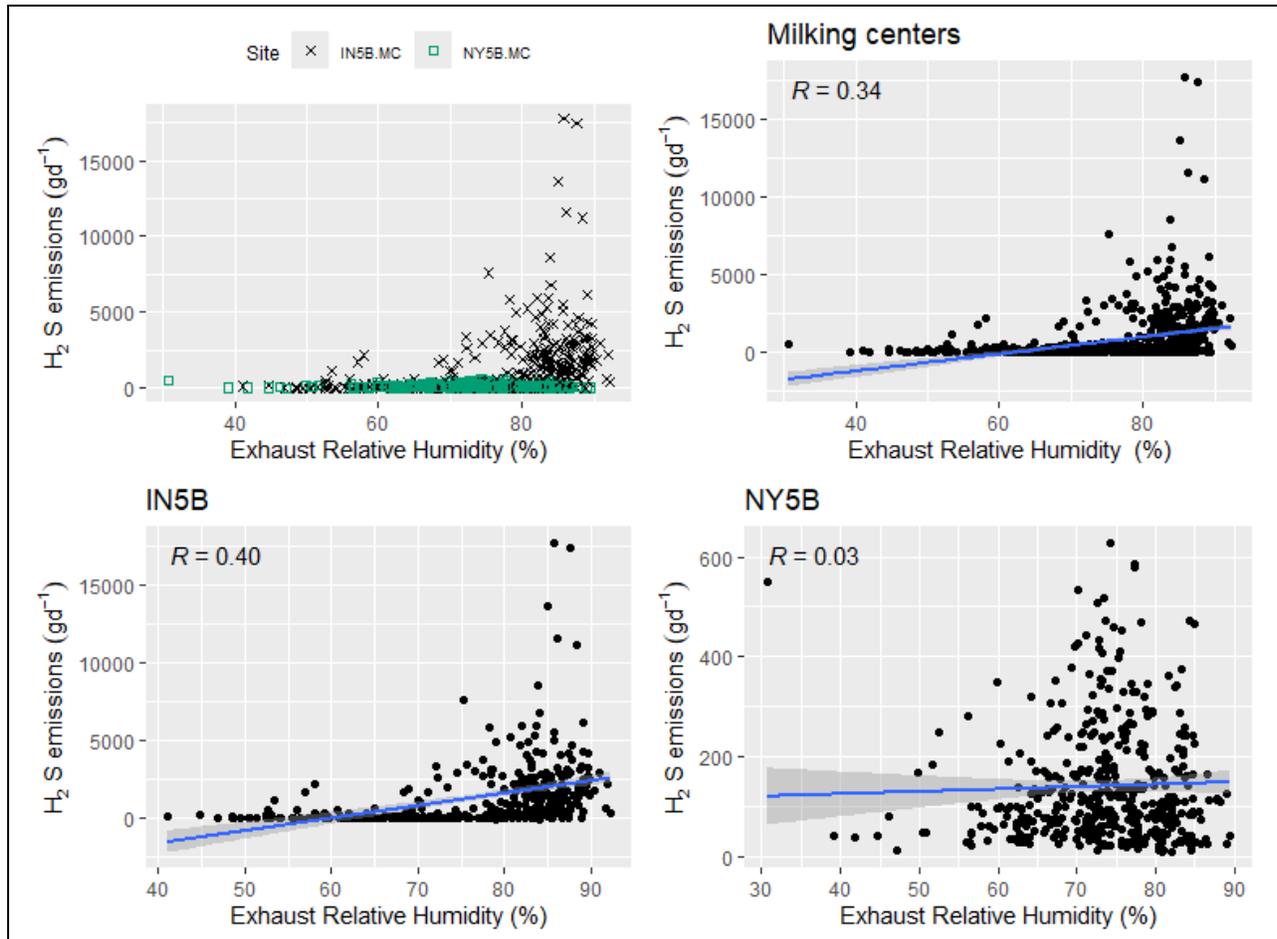


Figure 2.21: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus exhaust relative humidity.

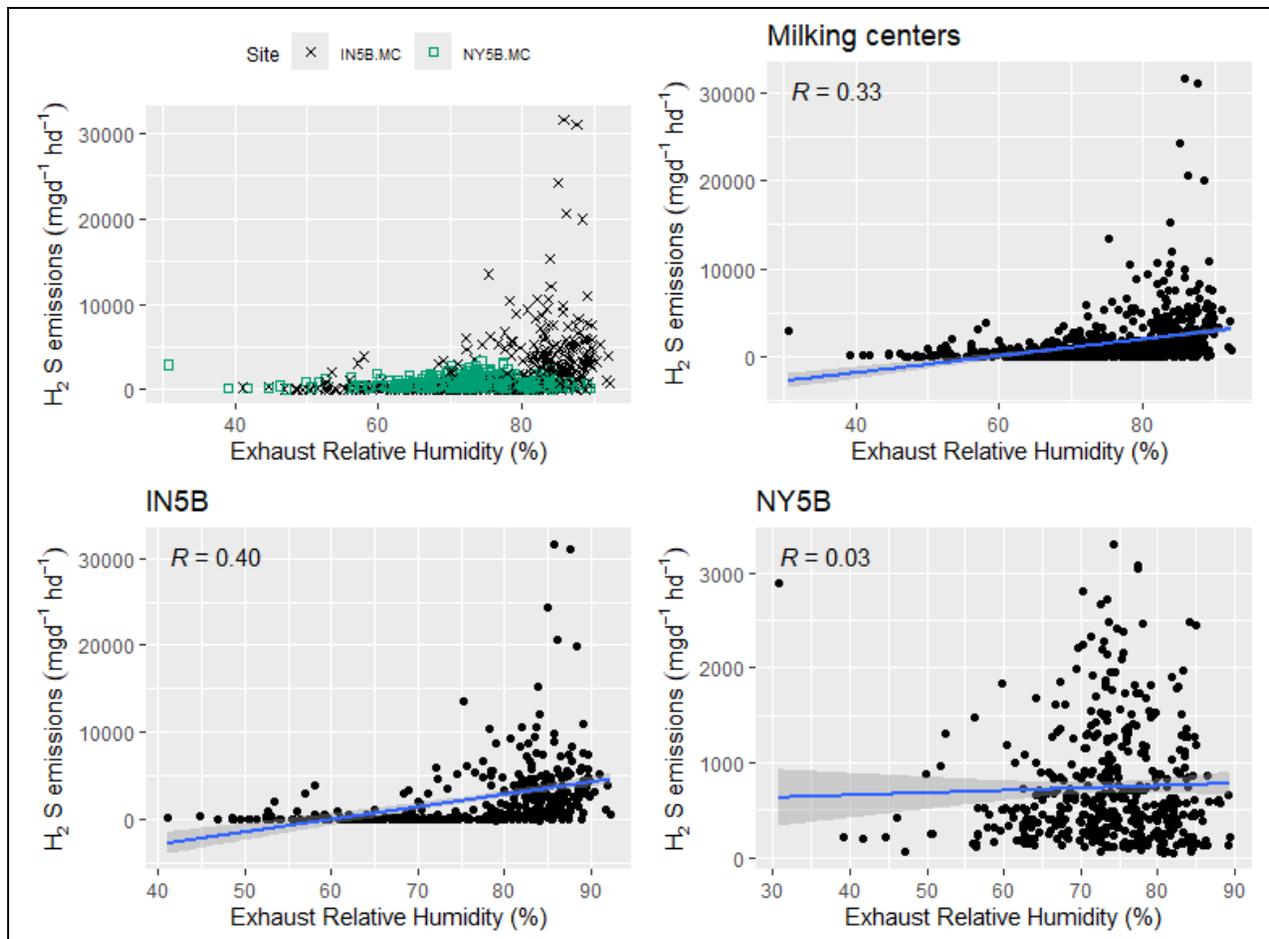


Figure 2.22: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

2.1.2.6 Airflow

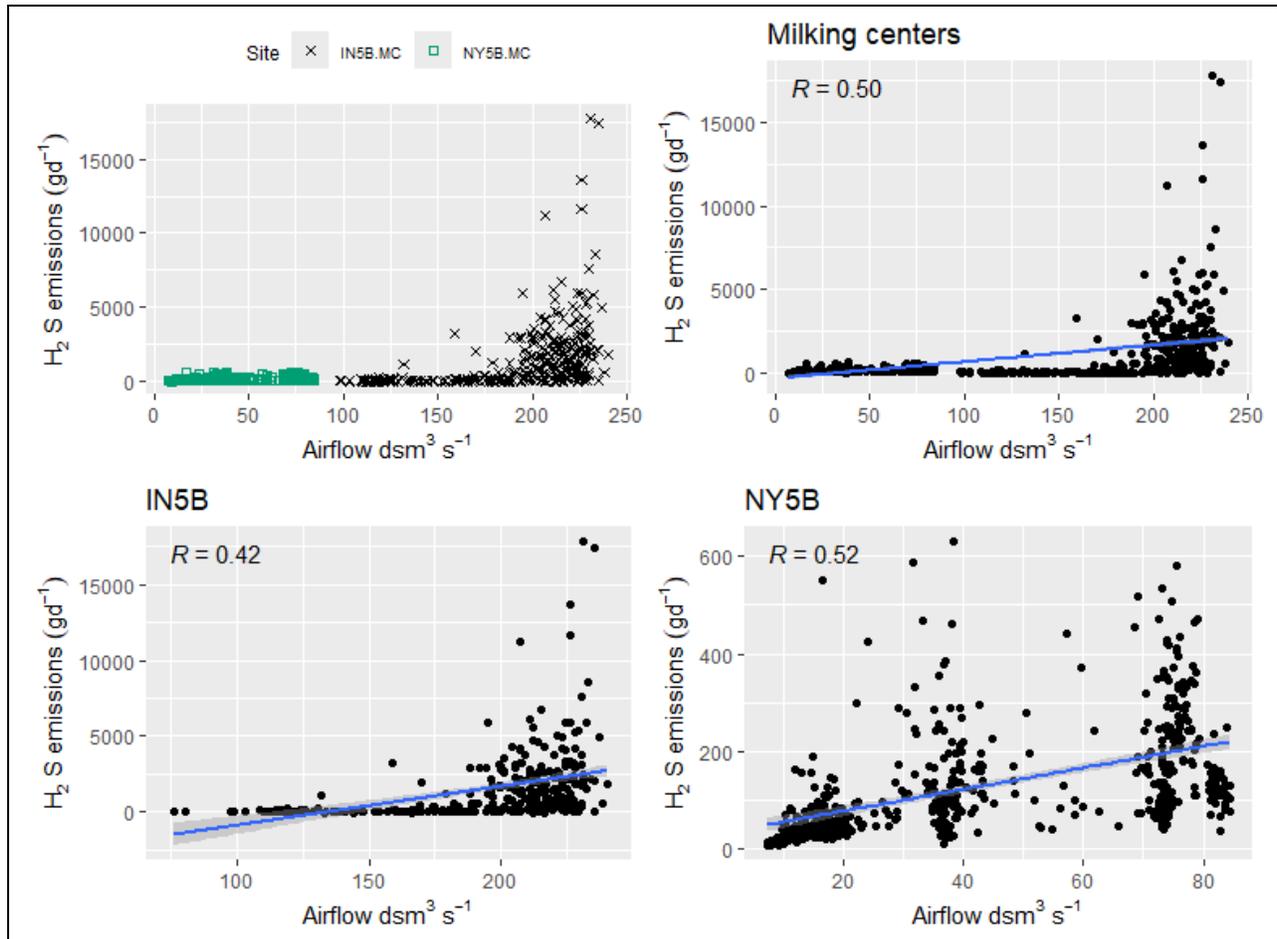


Figure 2.23: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus airflow.

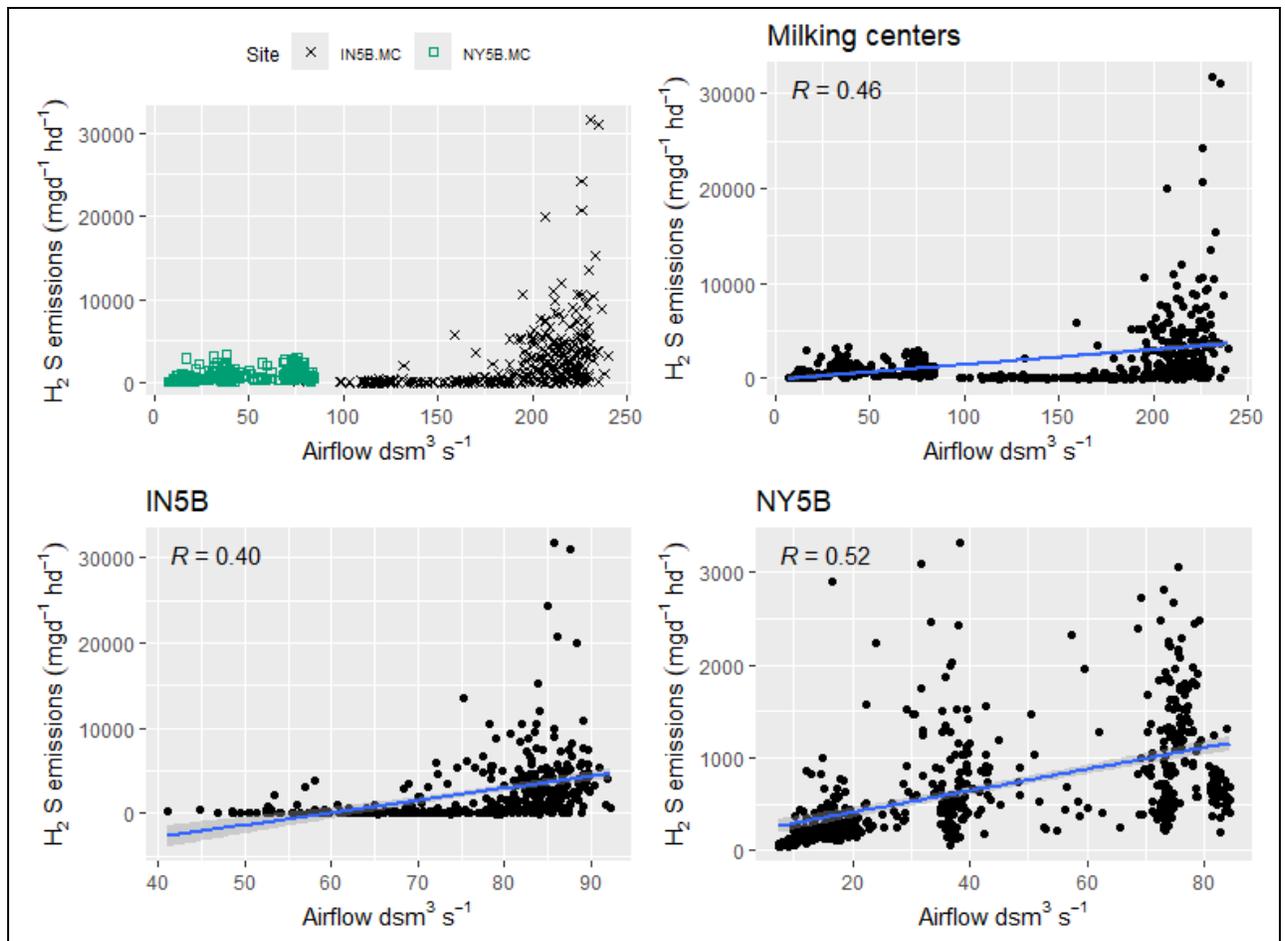


Figure 2.24: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus airflow.

2.1.3 Particulate Matter (PM₁₀)

2.1.3.1 Inventory

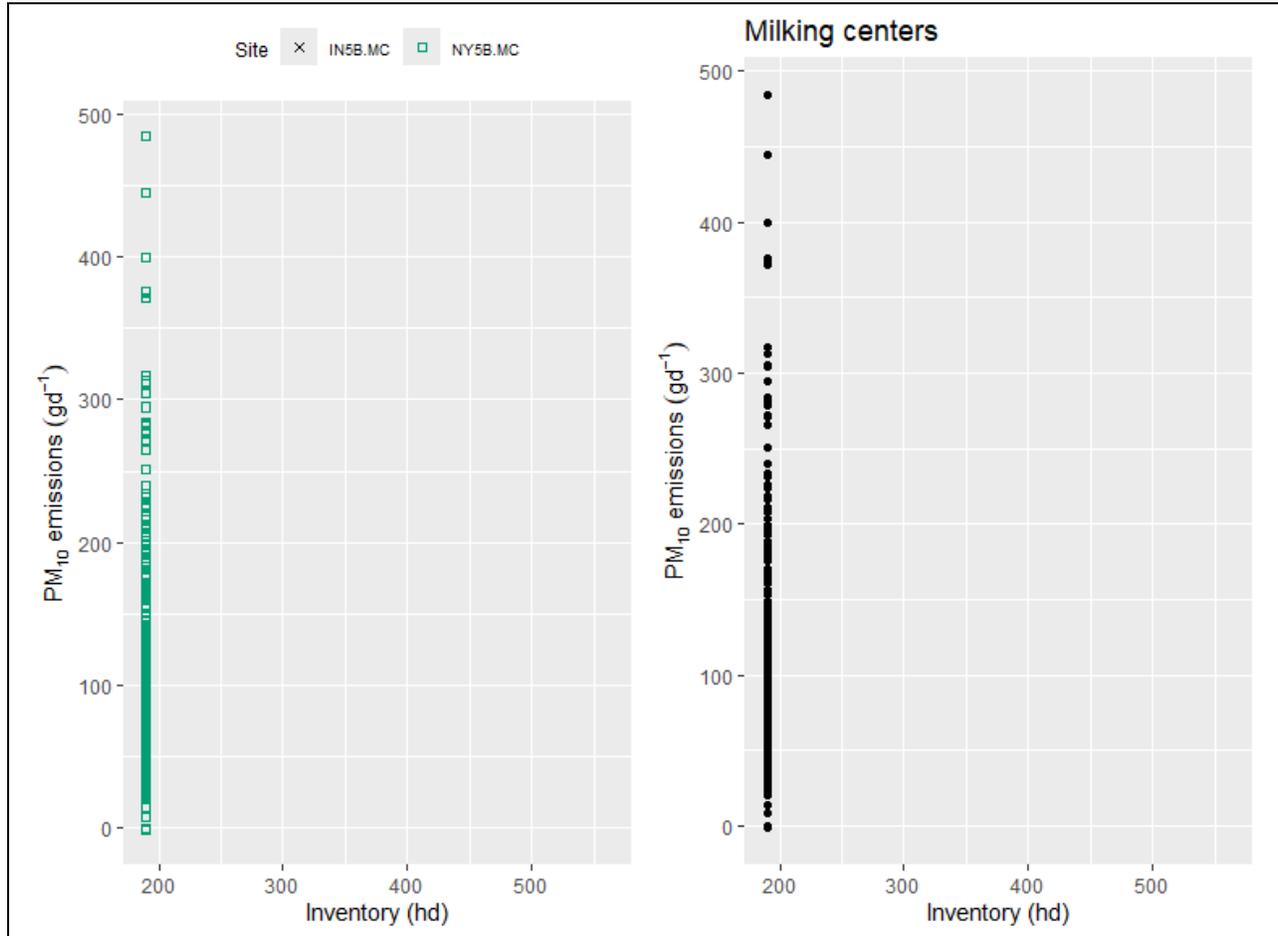


Figure 2.25: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus Inventory.

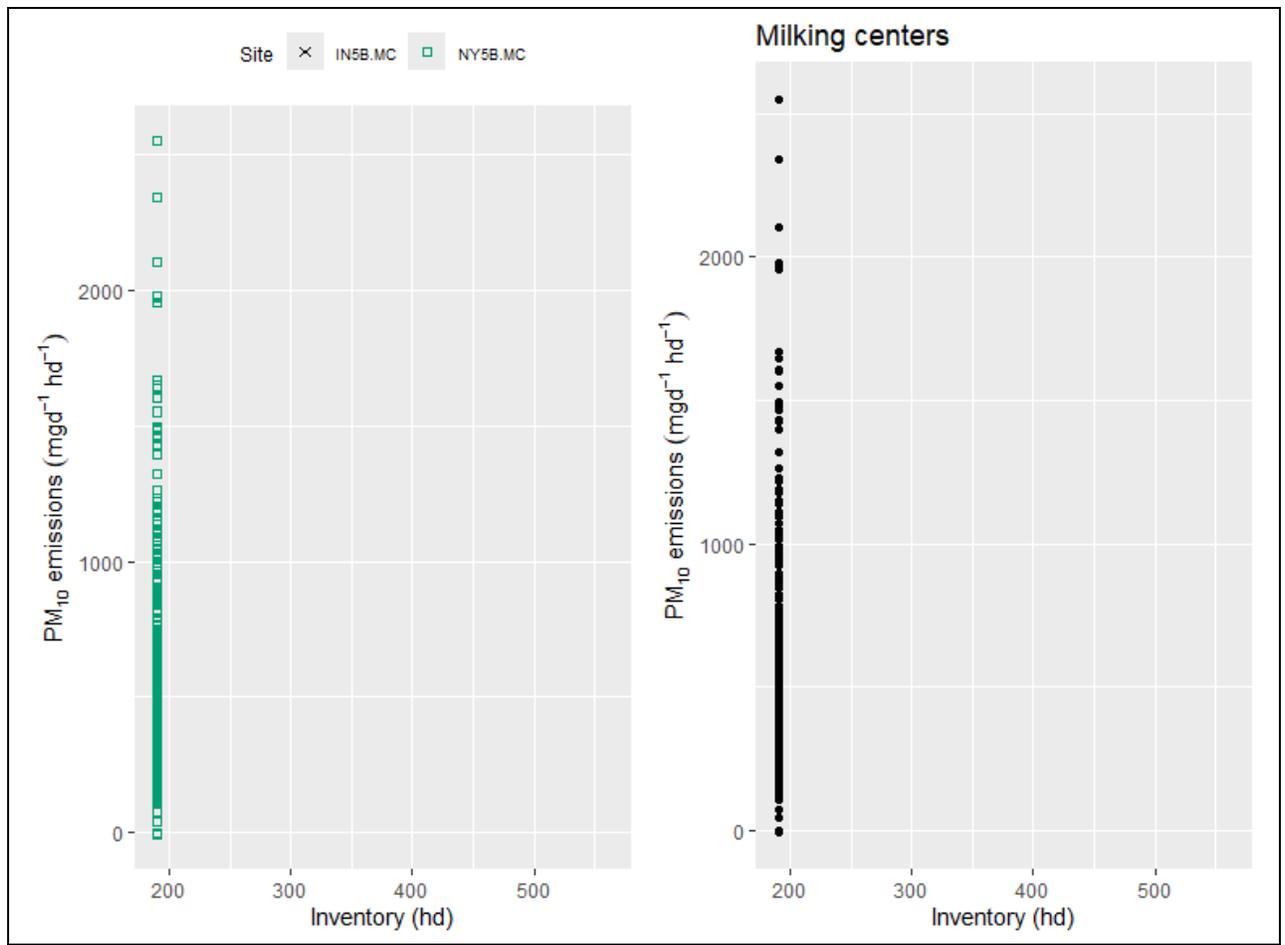


Figure 2.26: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus Inventory.

2.1.3.2 Average animal weight

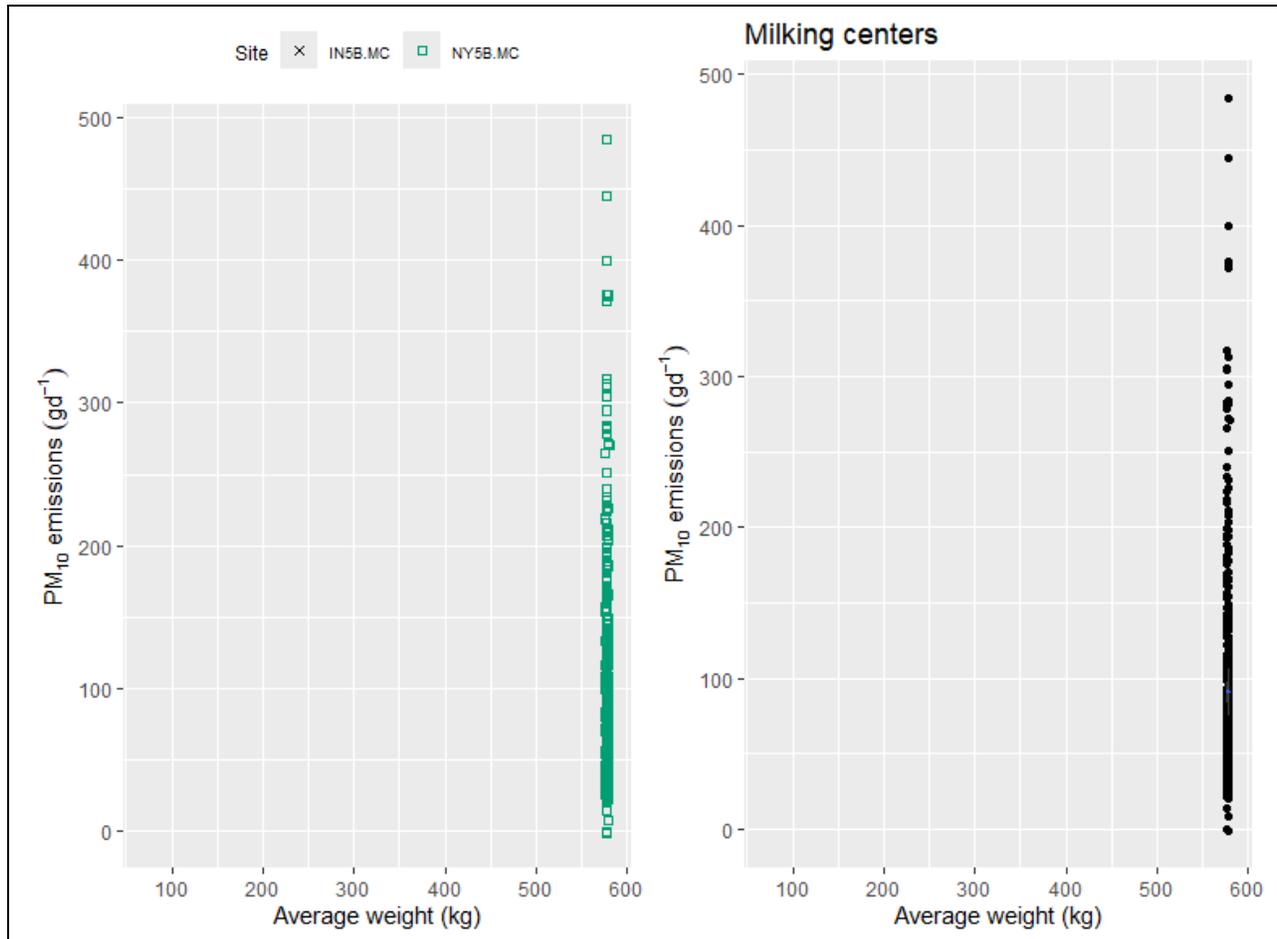


Figure 2.27: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus average animal weight.

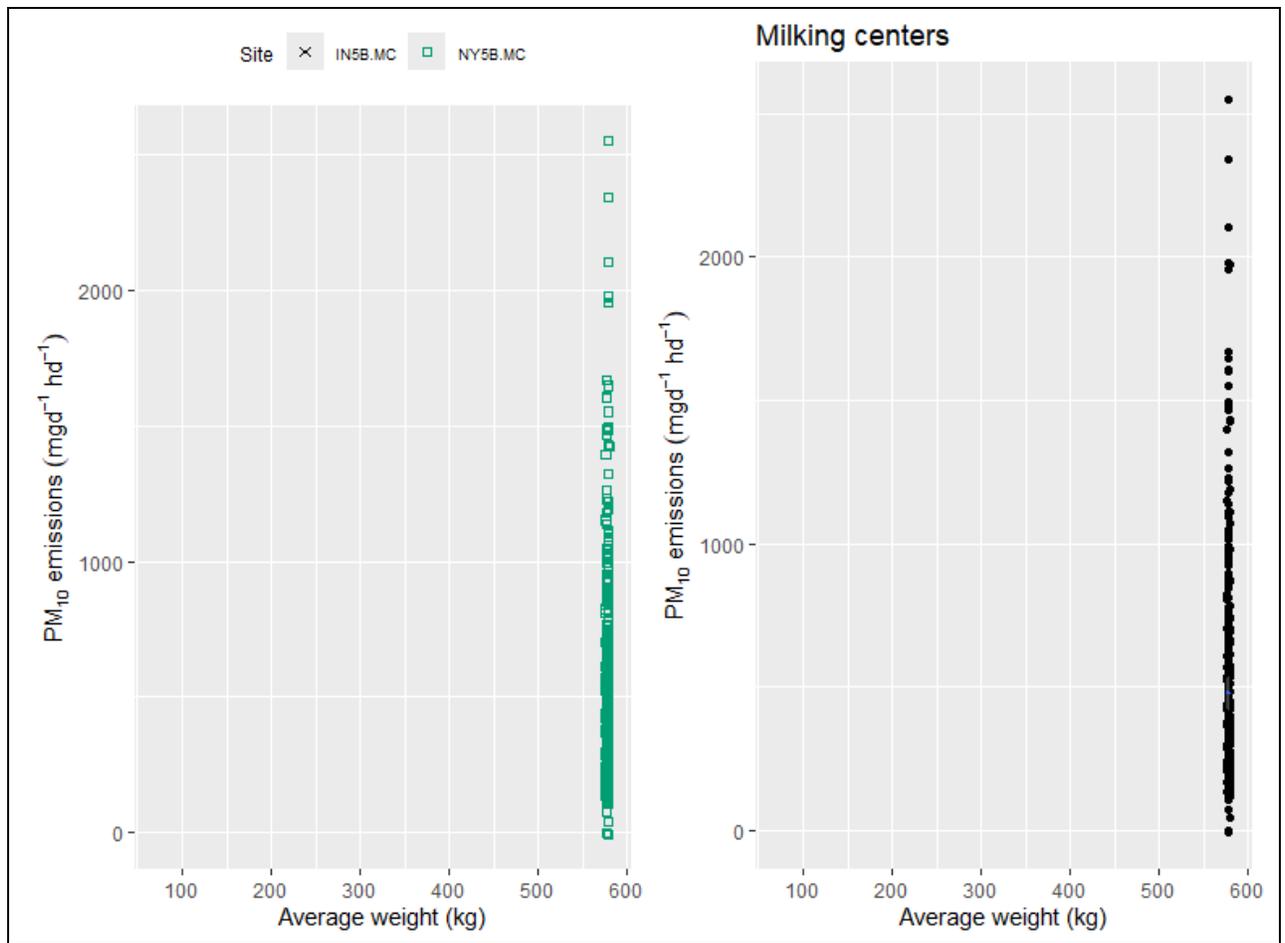


Figure 2.28: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus average animal weight.

2.1.3.3 *Live animal weight*

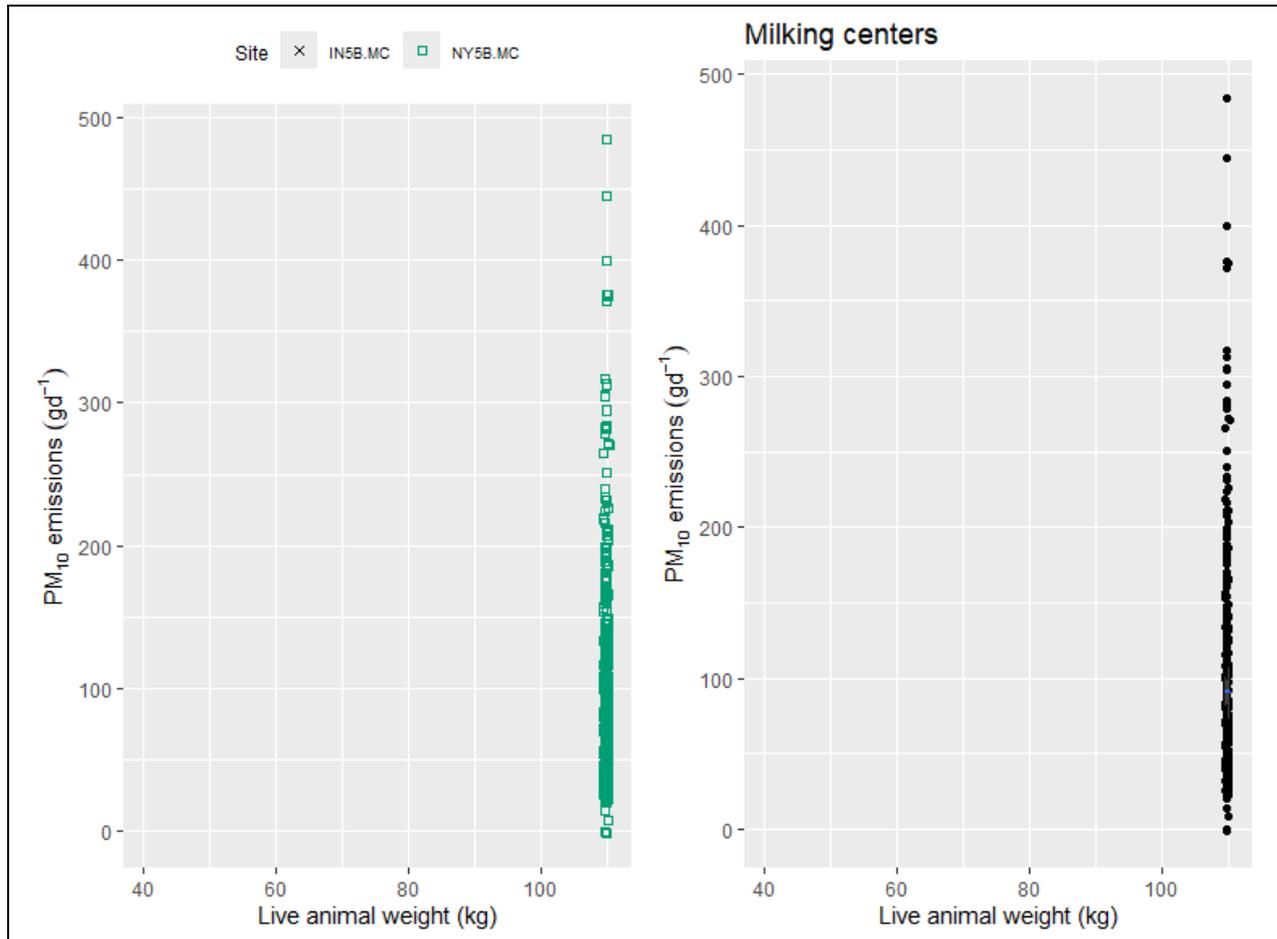


Figure 2.29: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus live animal weight.

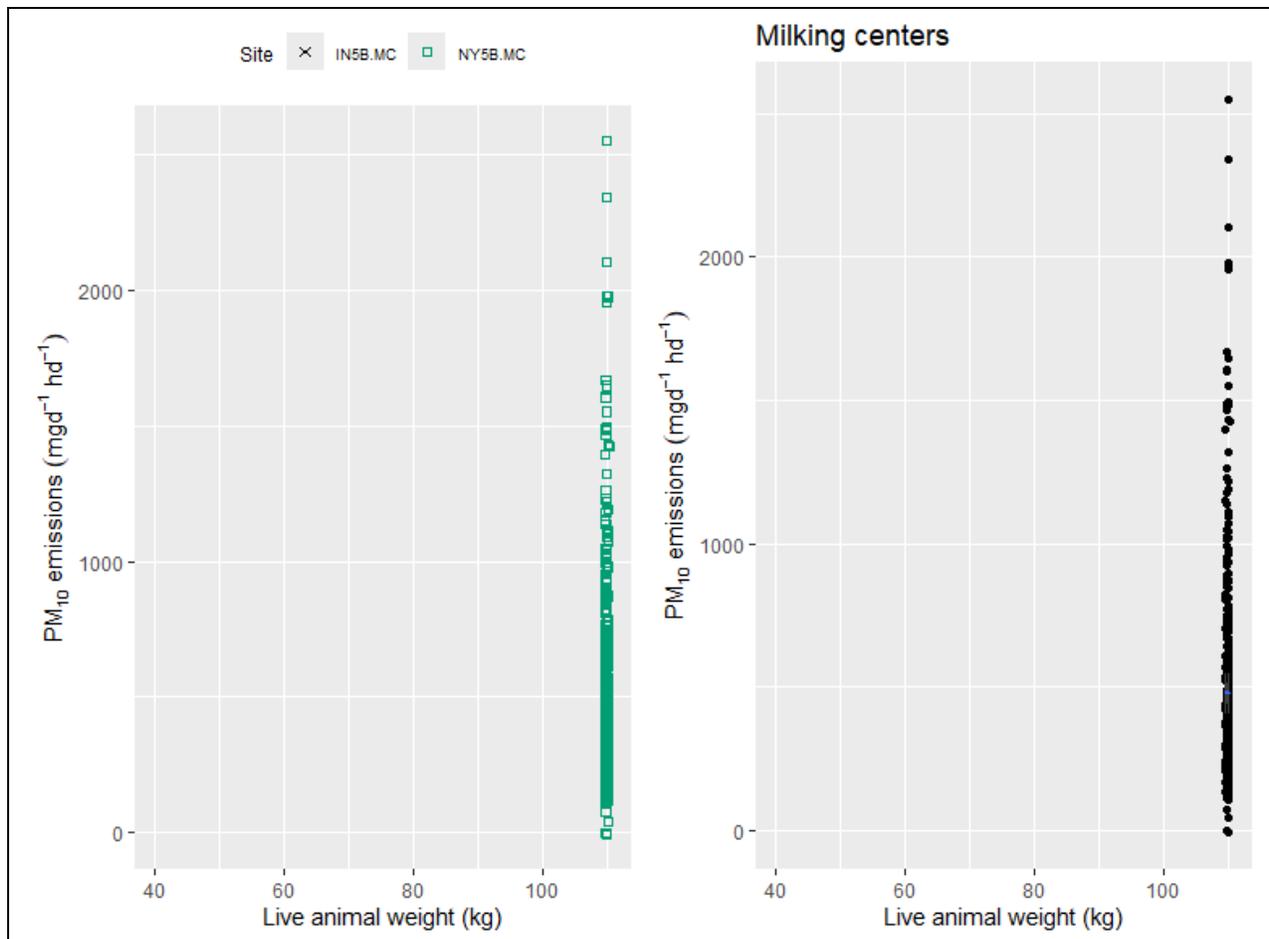


Figure 2.30: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus live animal weight.

2.1.3.4 Exhaust temperature

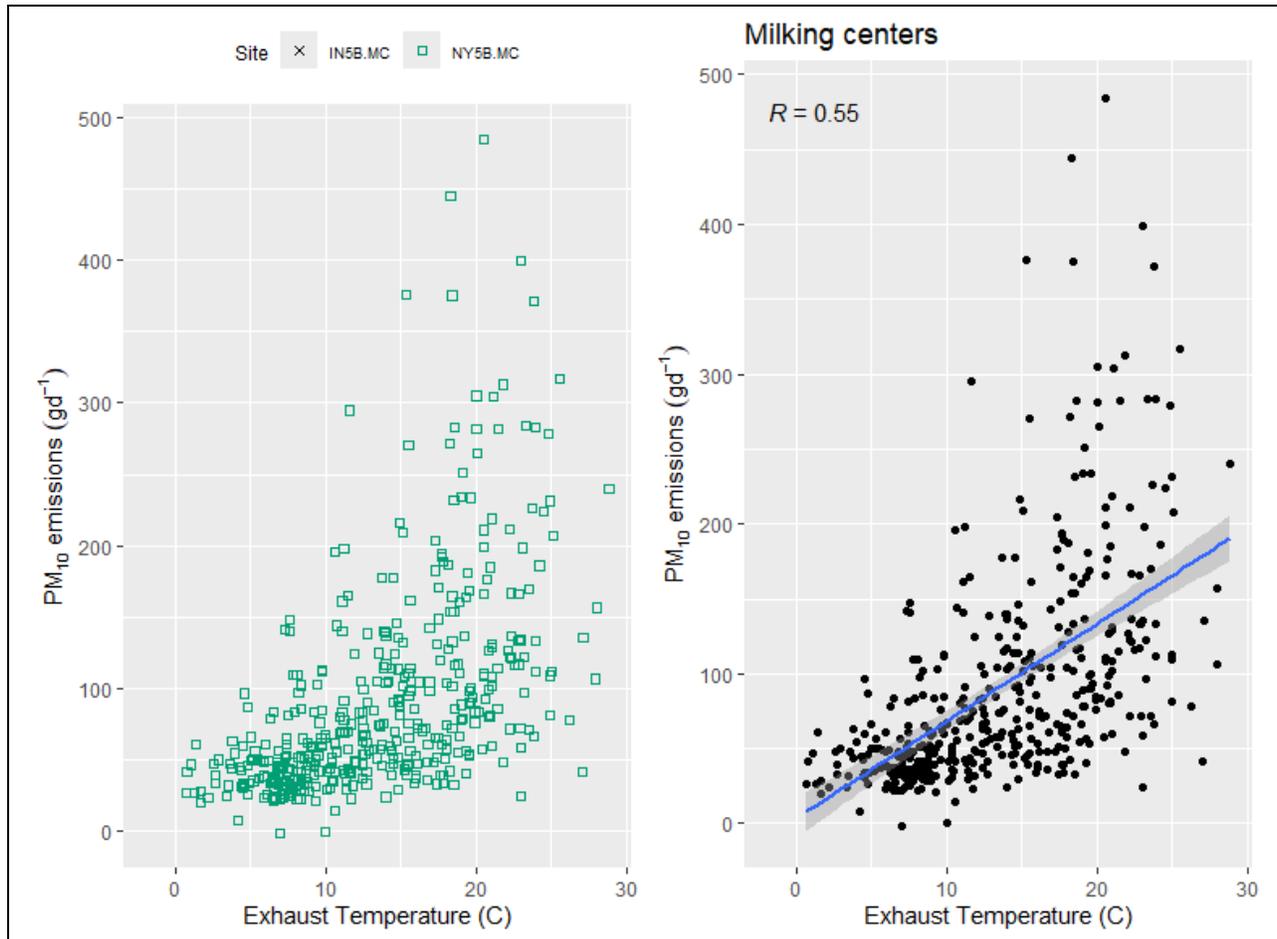


Figure 2.31: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus exhaust temperature.

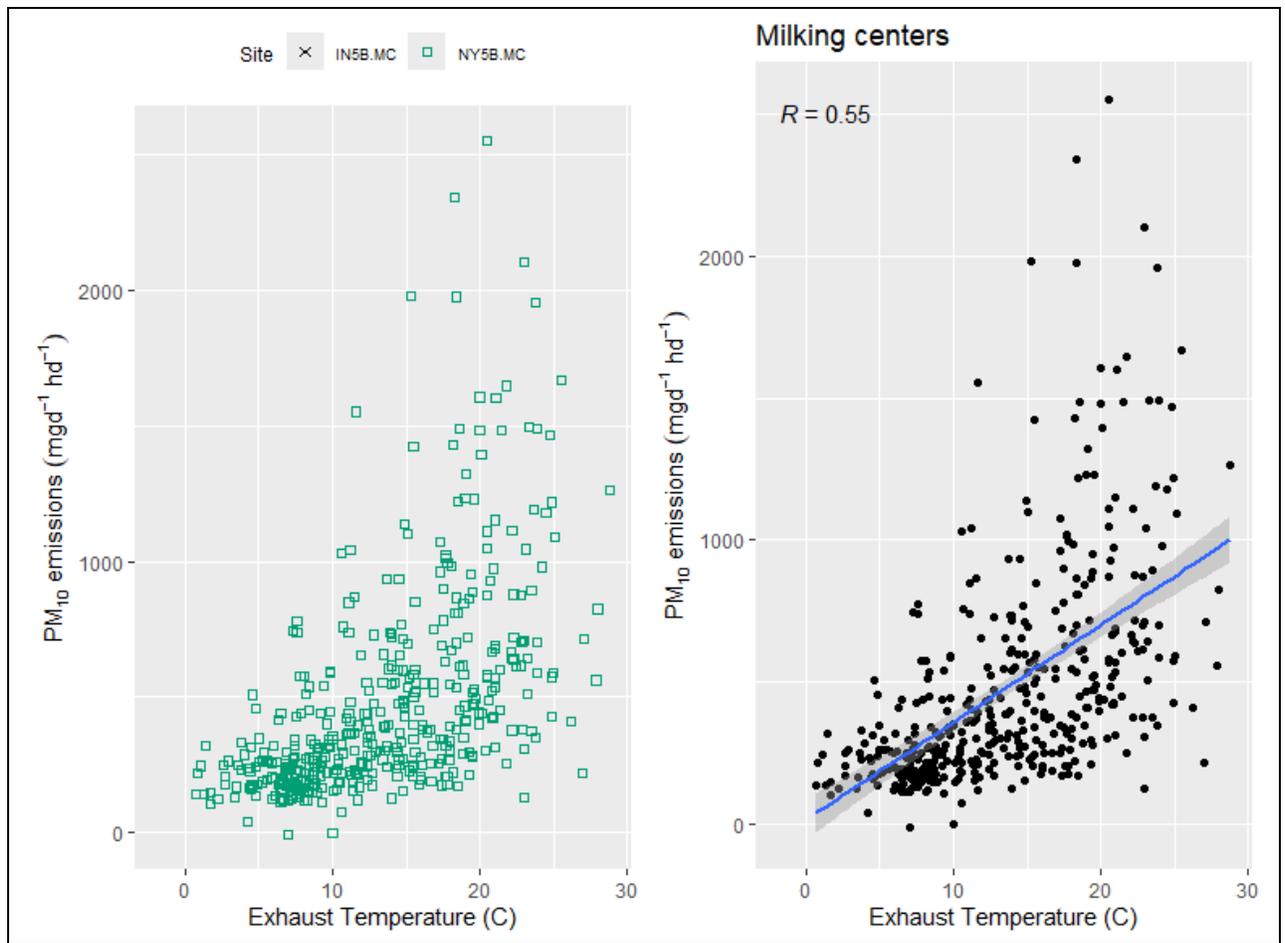


Figure 2.32: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

2.1.3.5 Exhaust relative humidity

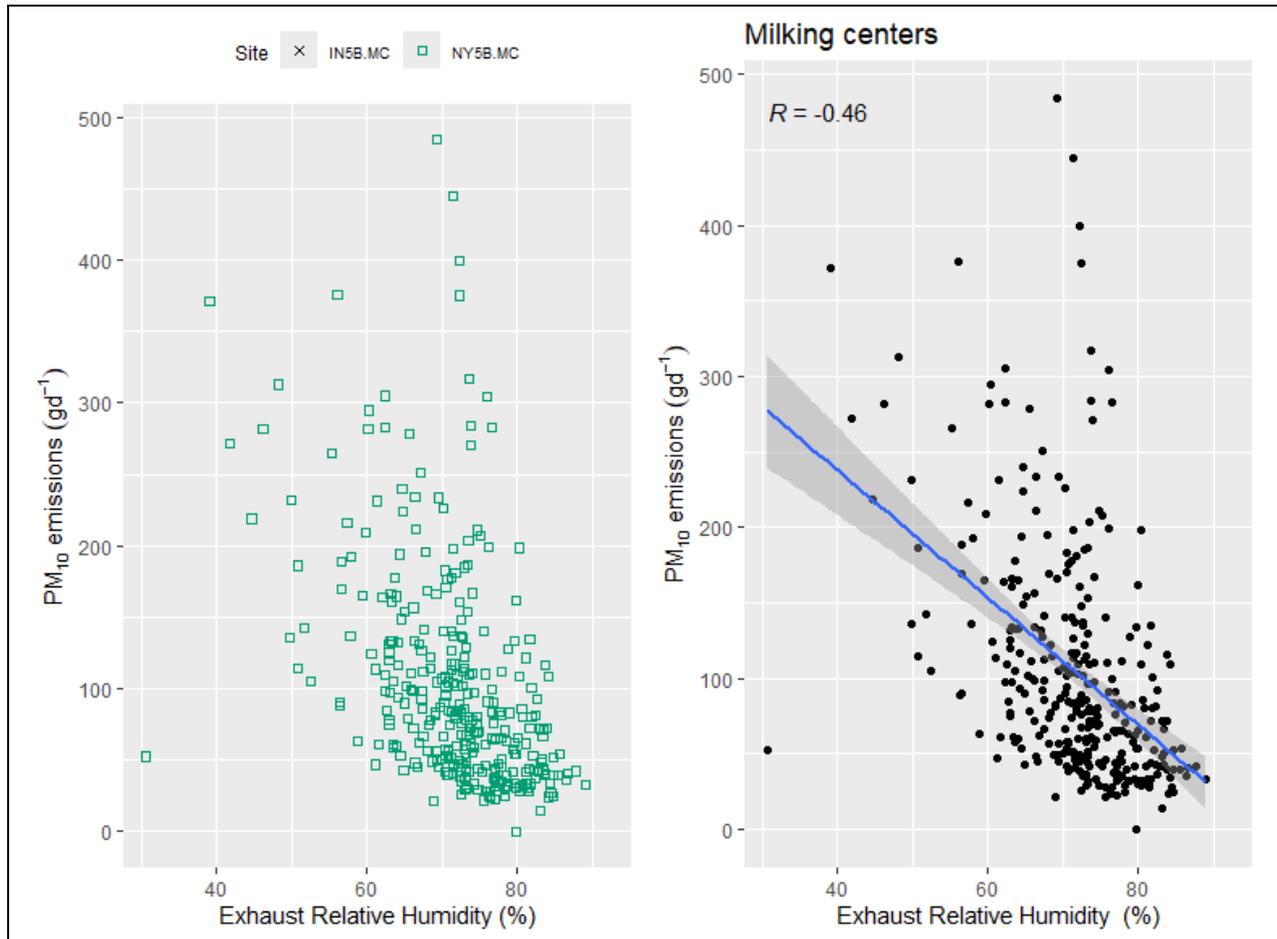


Figure 2.33: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus exhaust relative humidity.

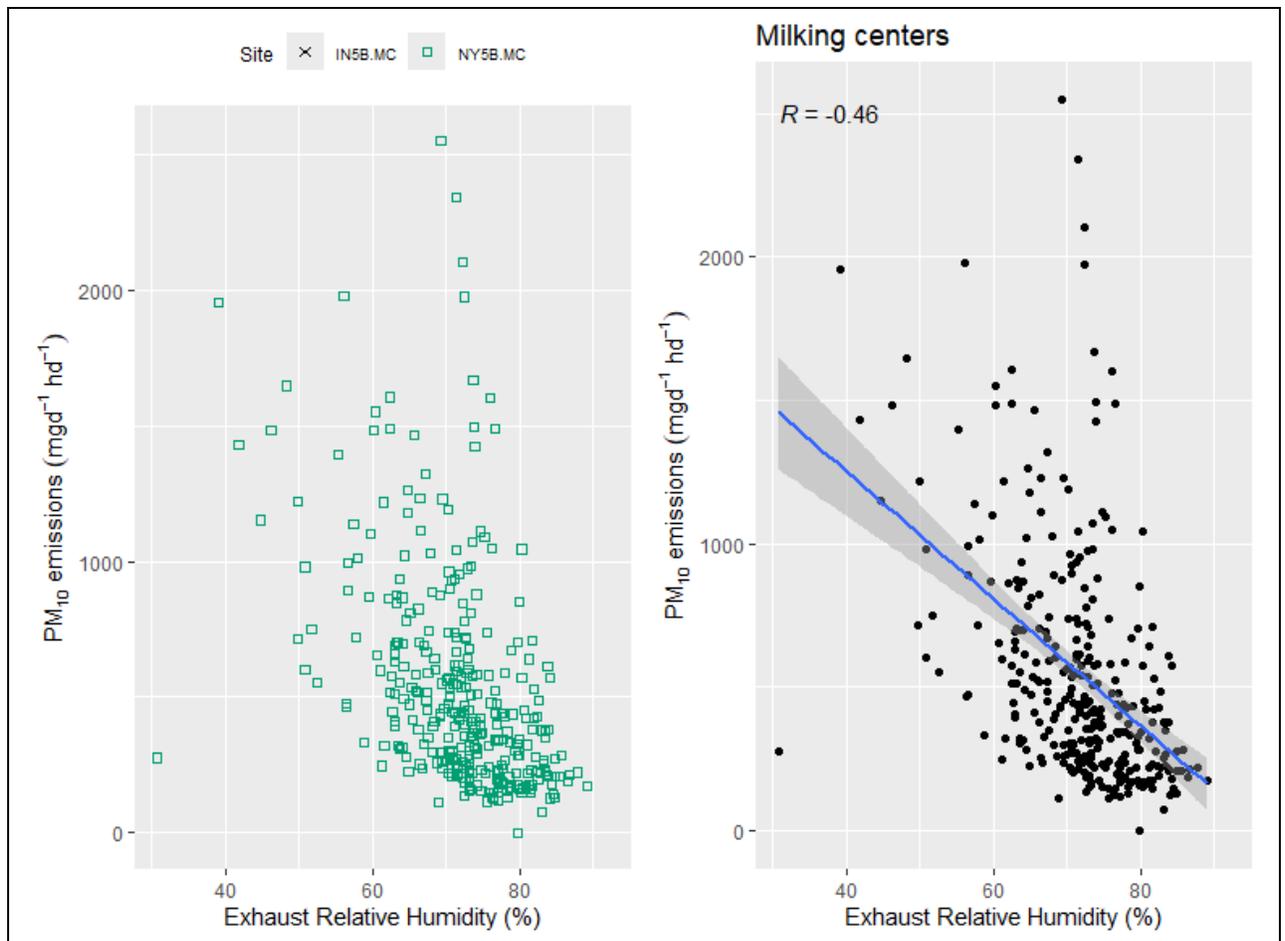


Figure 2.34: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

2.1.3.6 Airflow

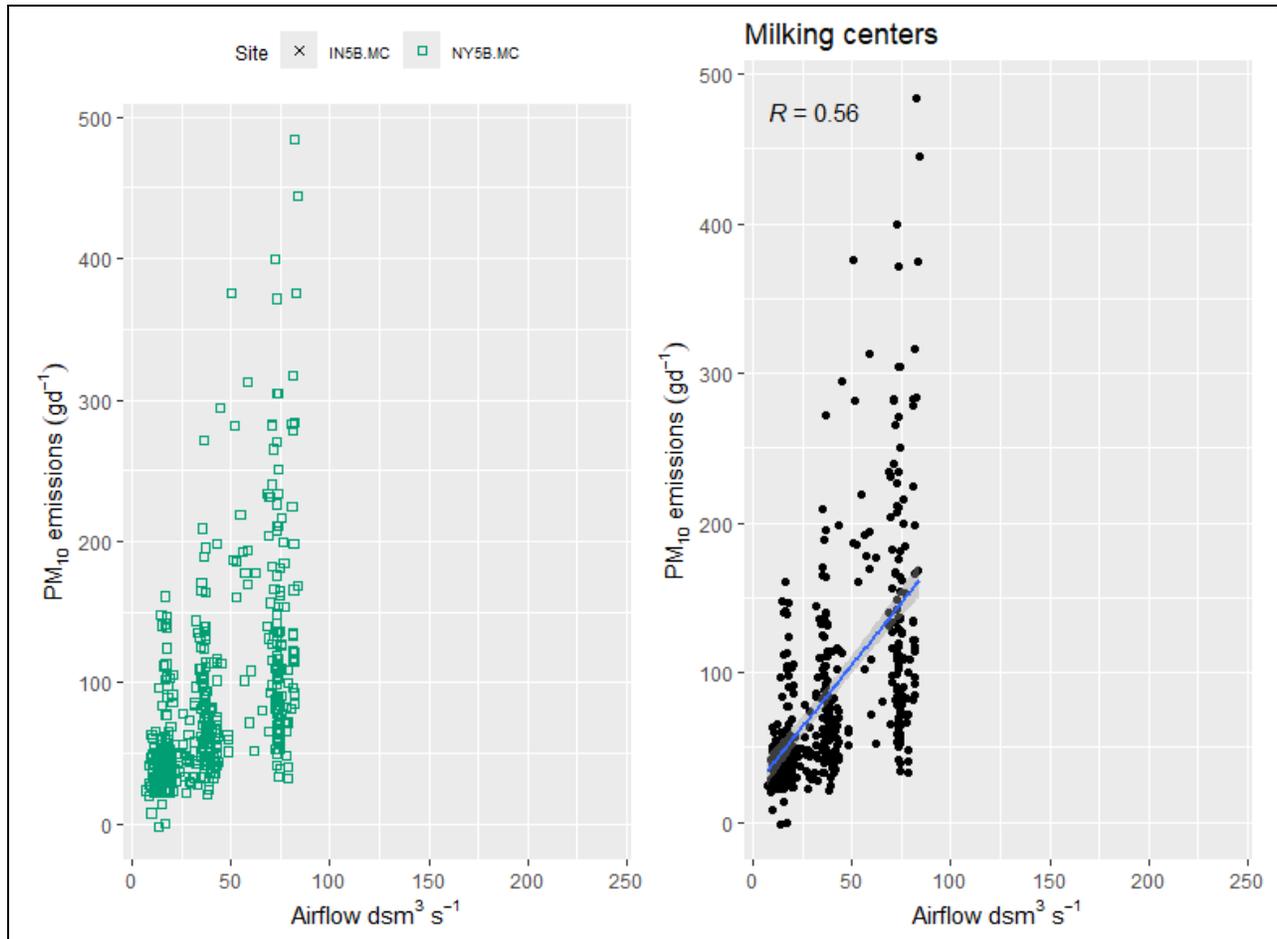


Figure 2.35: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus airflow.

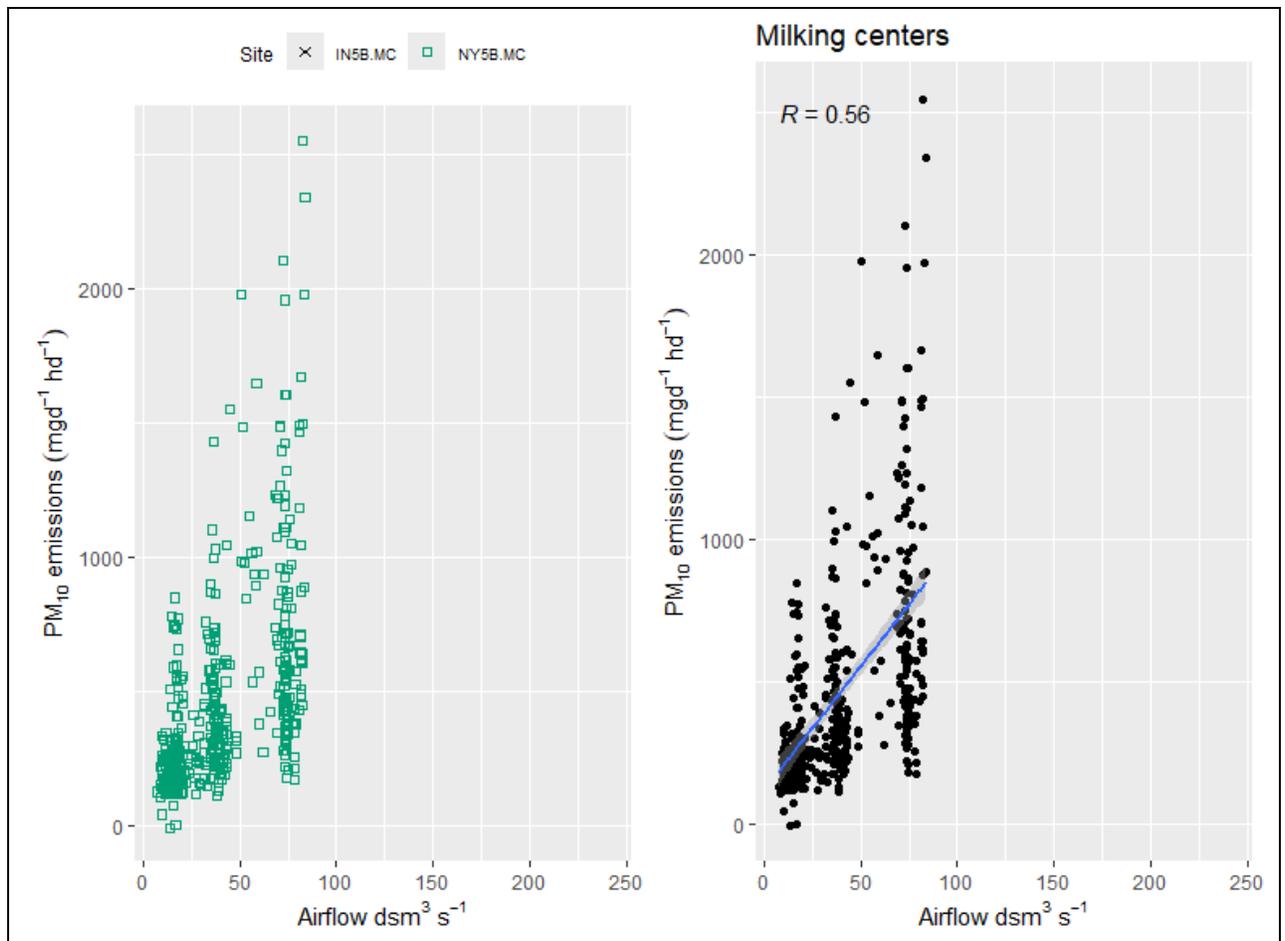


Figure 2.36: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus airflow.

2.1.4 Particulate Matter (PM_{2.5})

2.1.4.1 Inventory

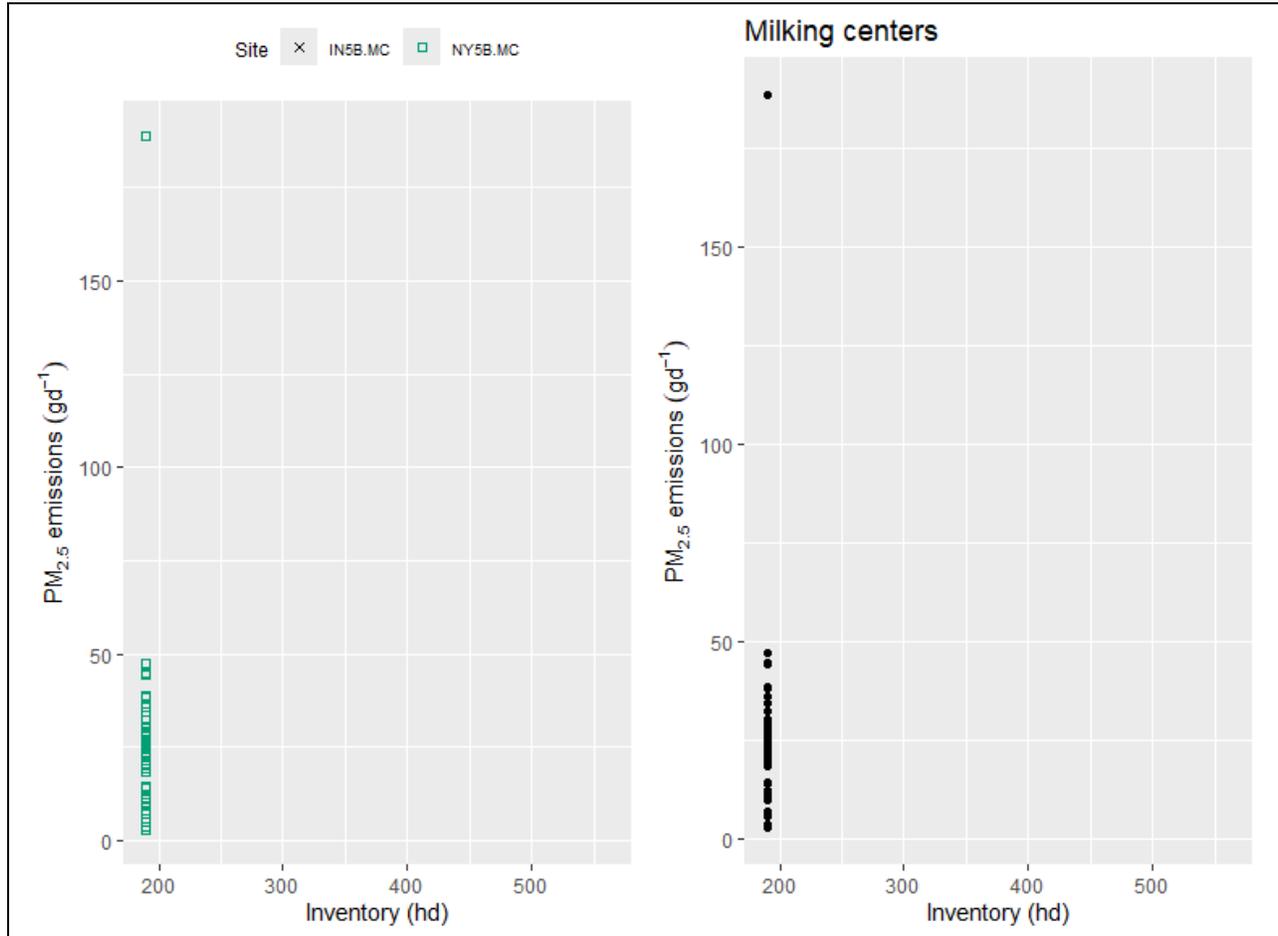


Figure 2.37: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus Inventory.

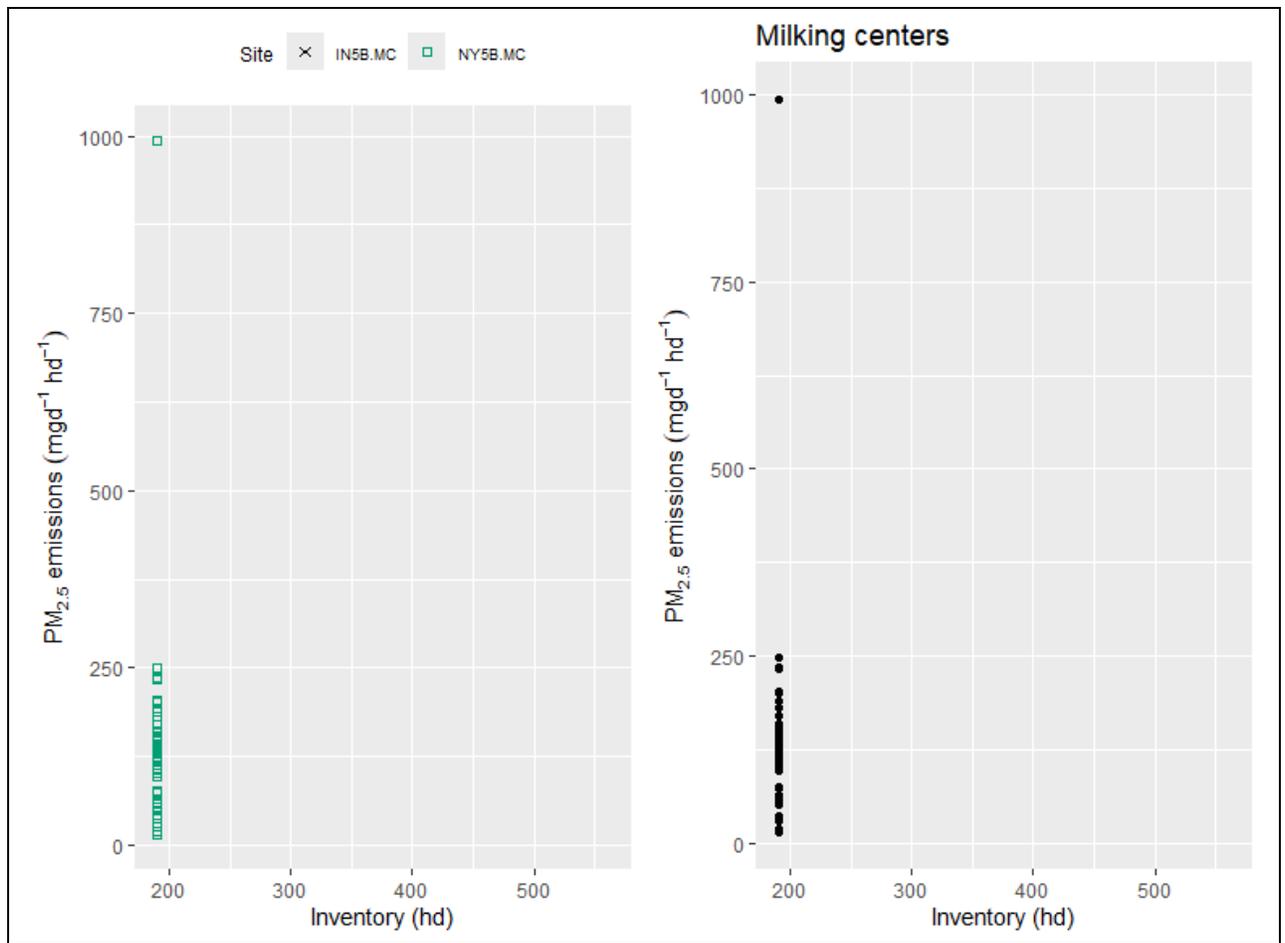


Figure 2.38: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus Inventory.

2.1.4.2 Average animal weight

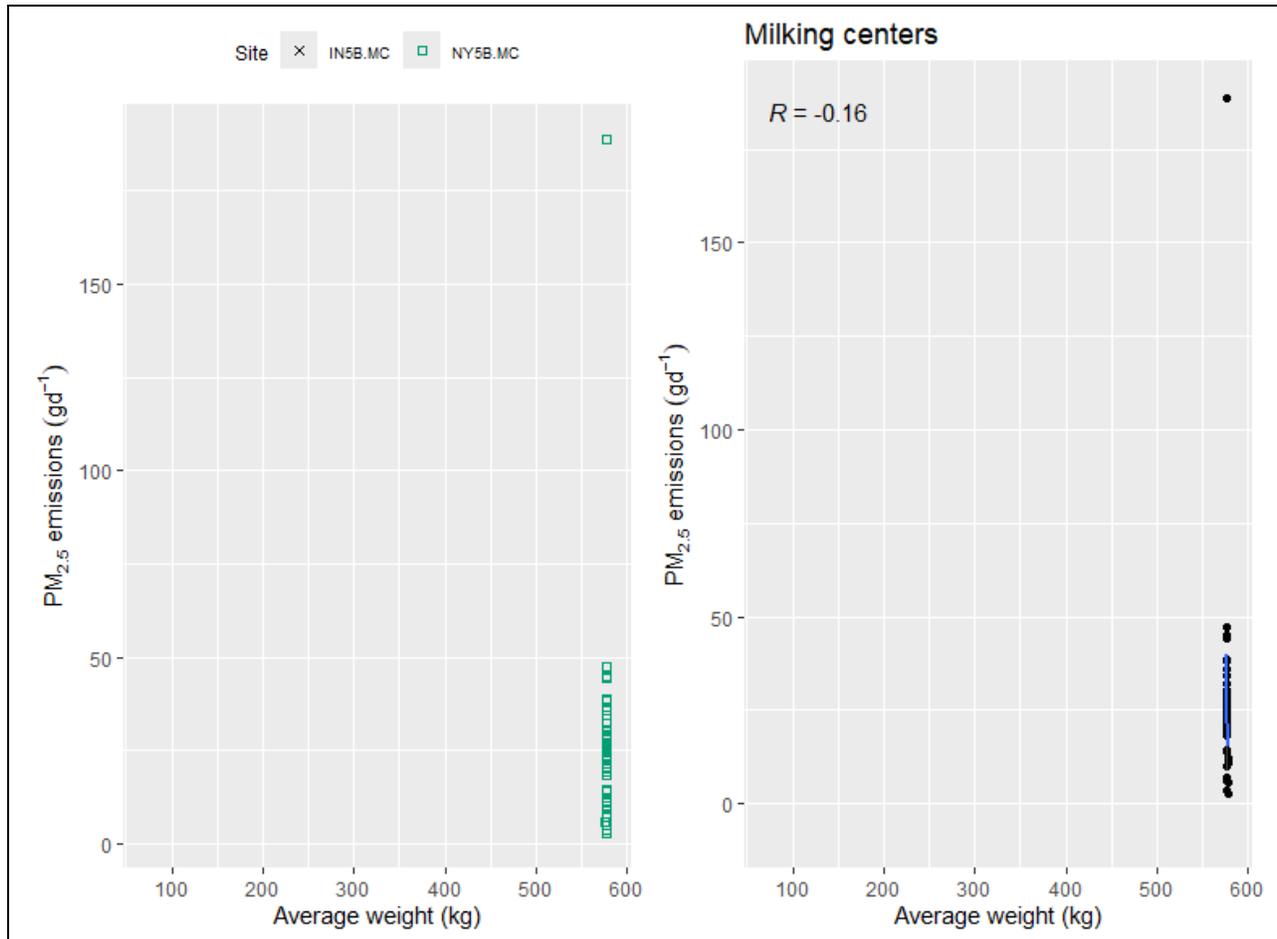


Figure 2.39: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus average animal weight.

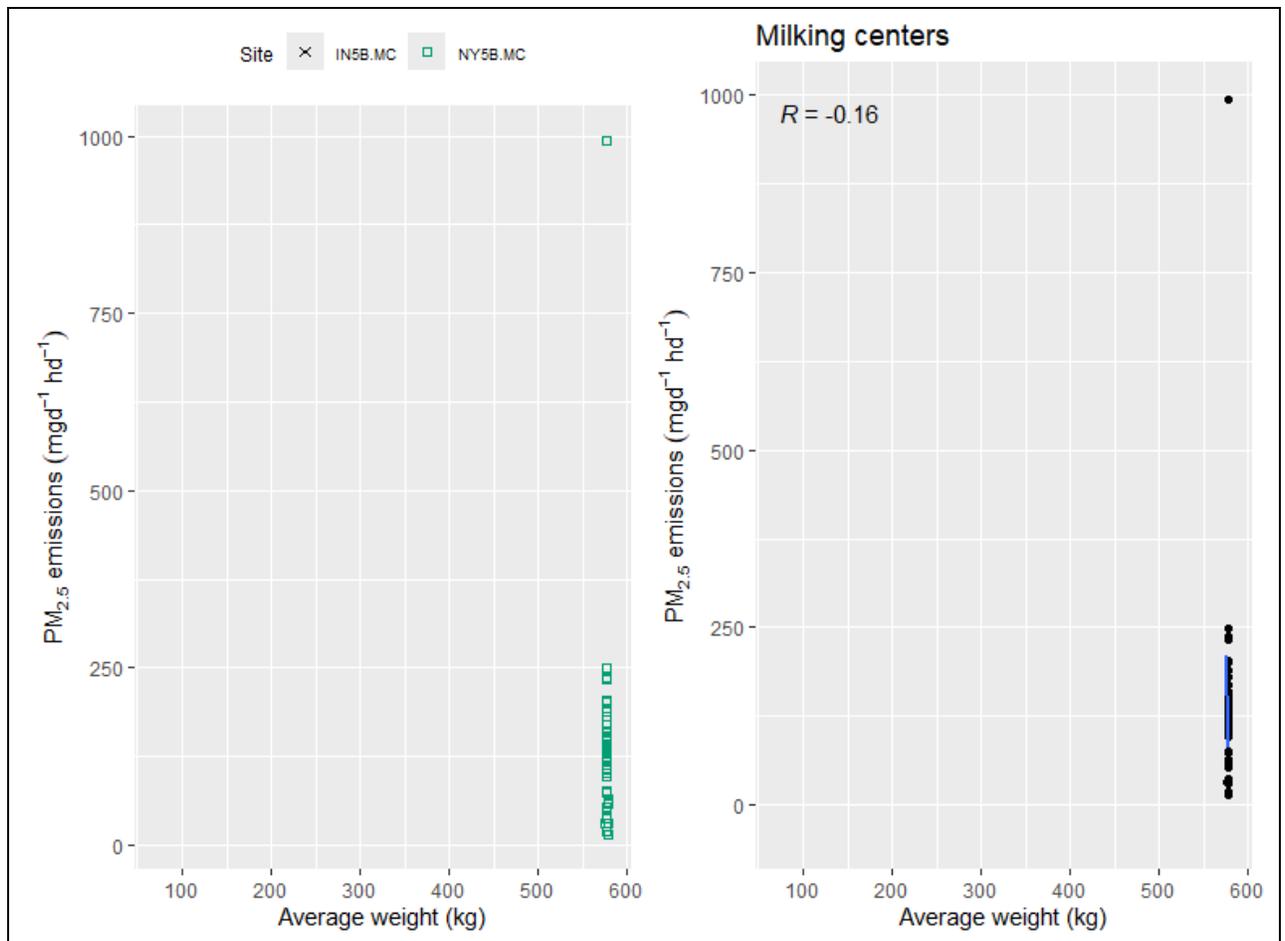


Figure 2.40: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus average animal weight.

2.1.4.3 Live animal weight

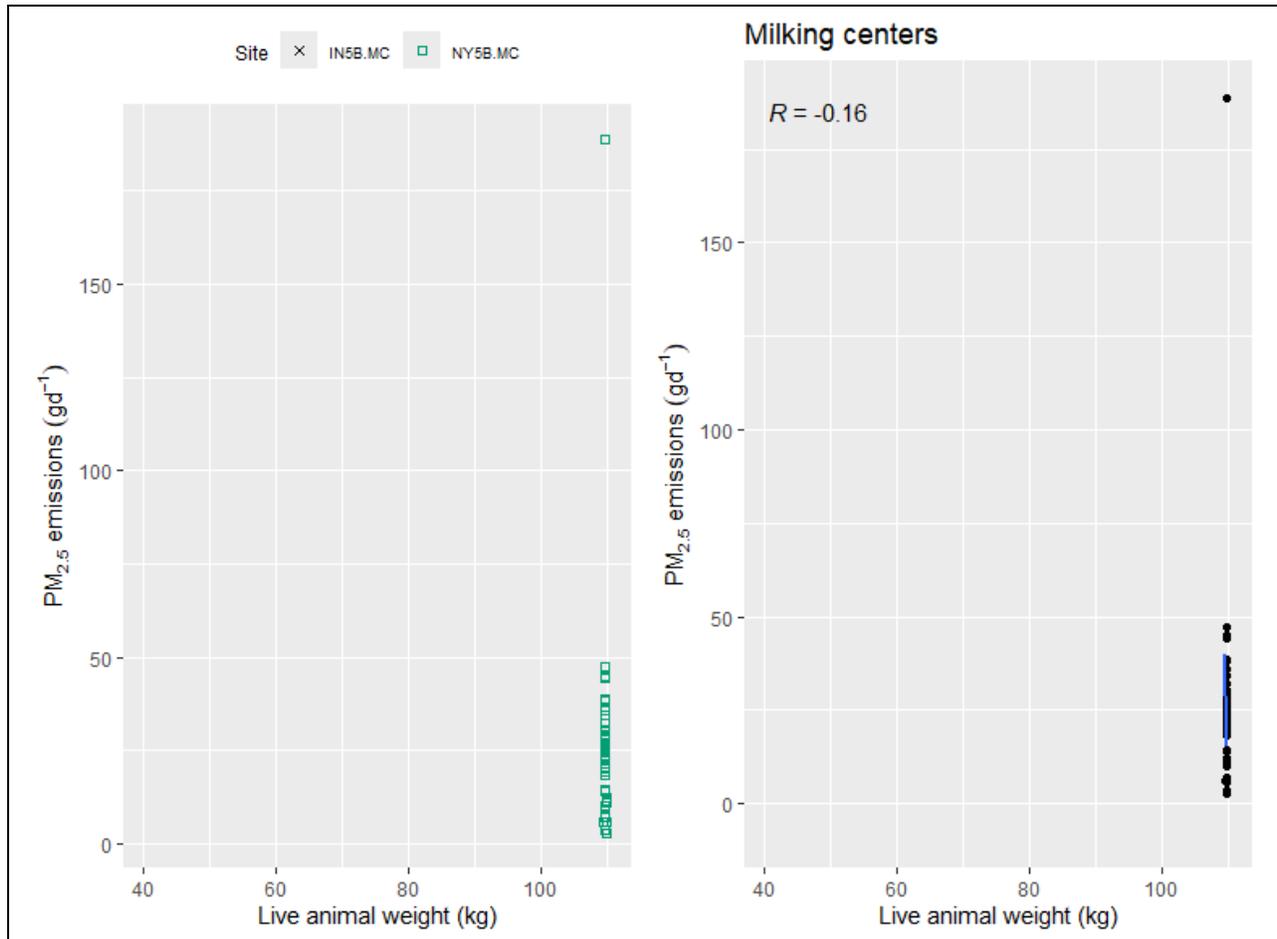


Figure 2.41: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus live animal weight.

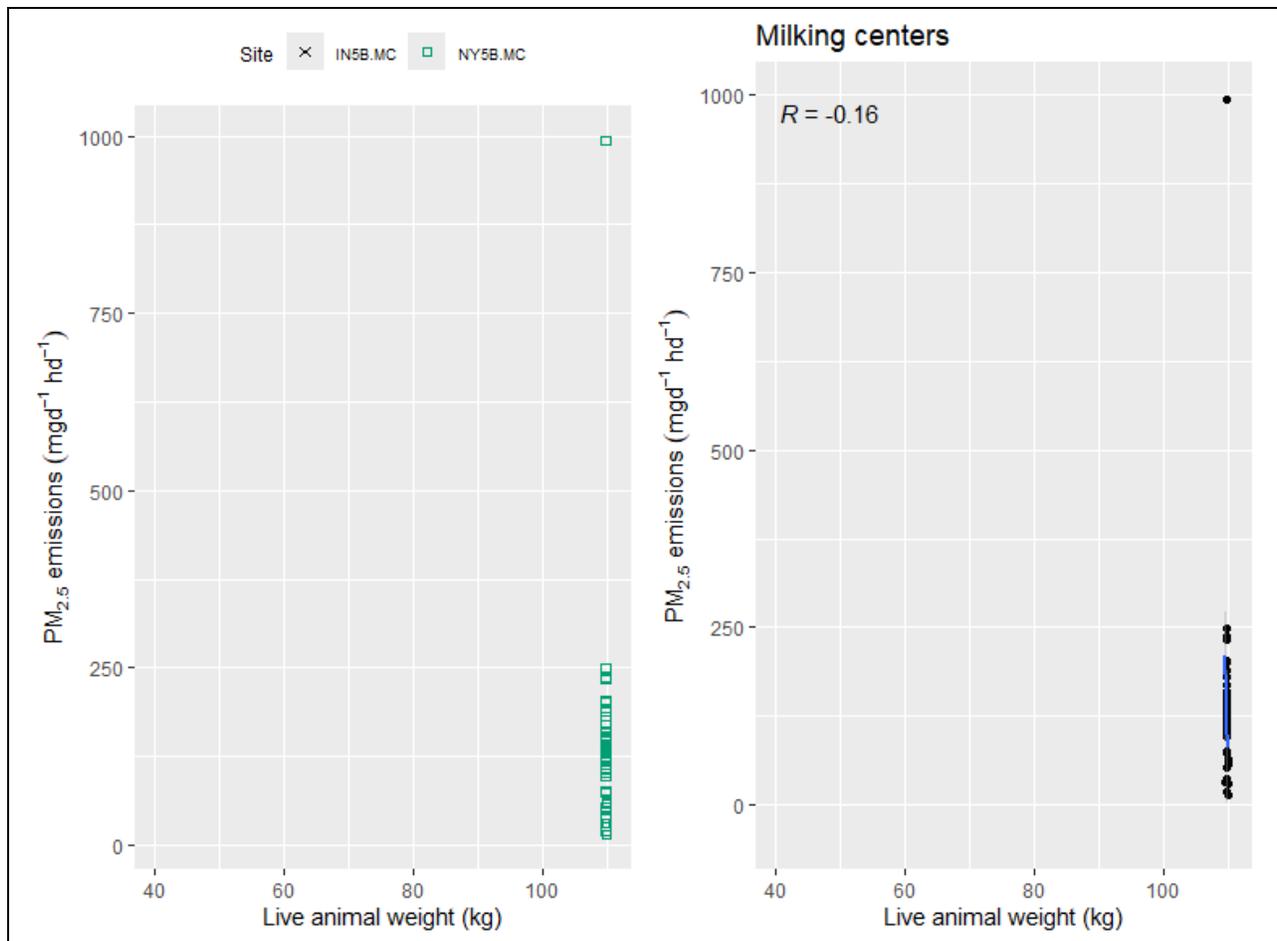


Figure 2.42: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus live animal weight.

2.1.4.4 Exhaust temperature

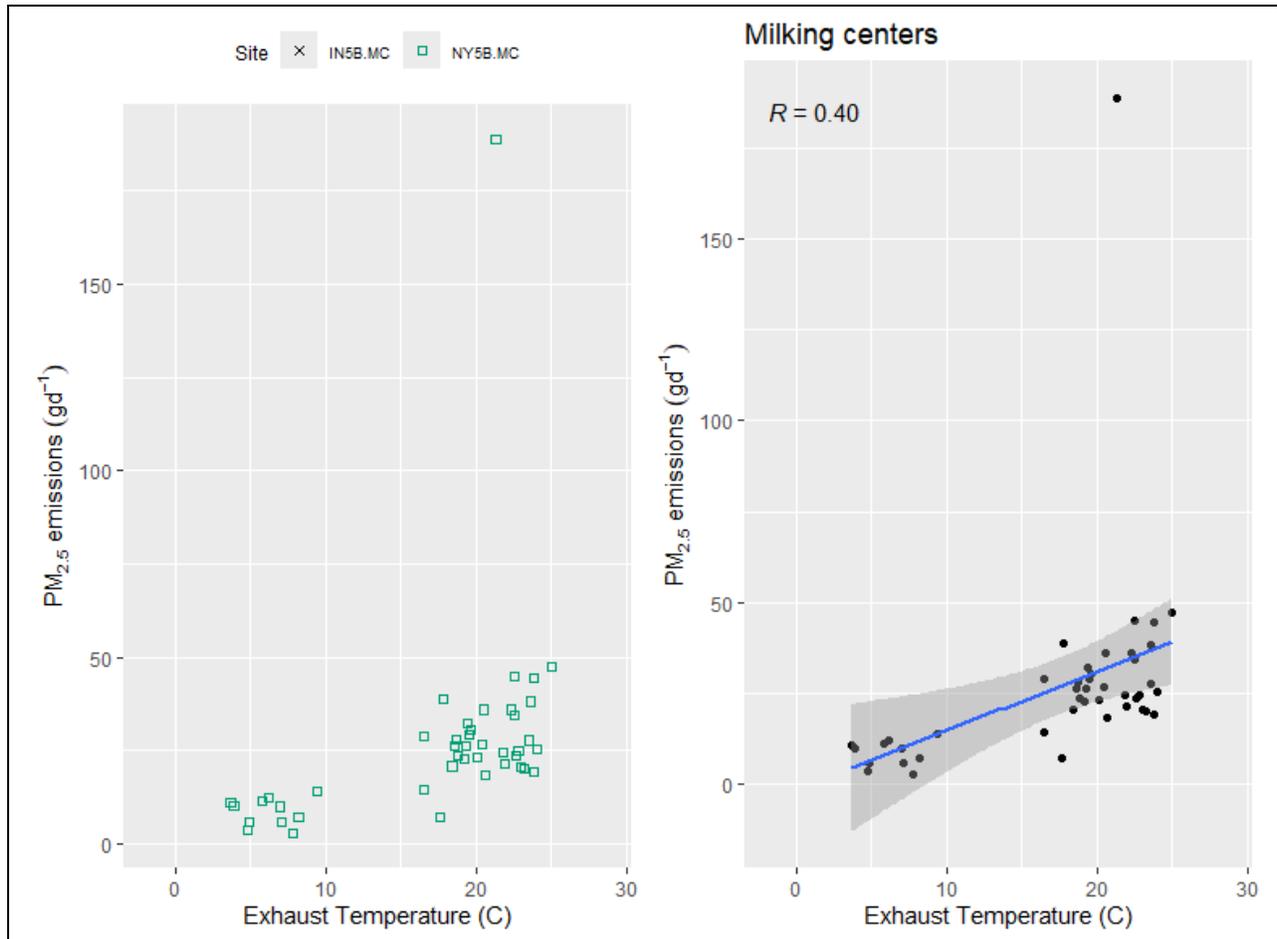


Figure 2.43: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus exhaust temperature.

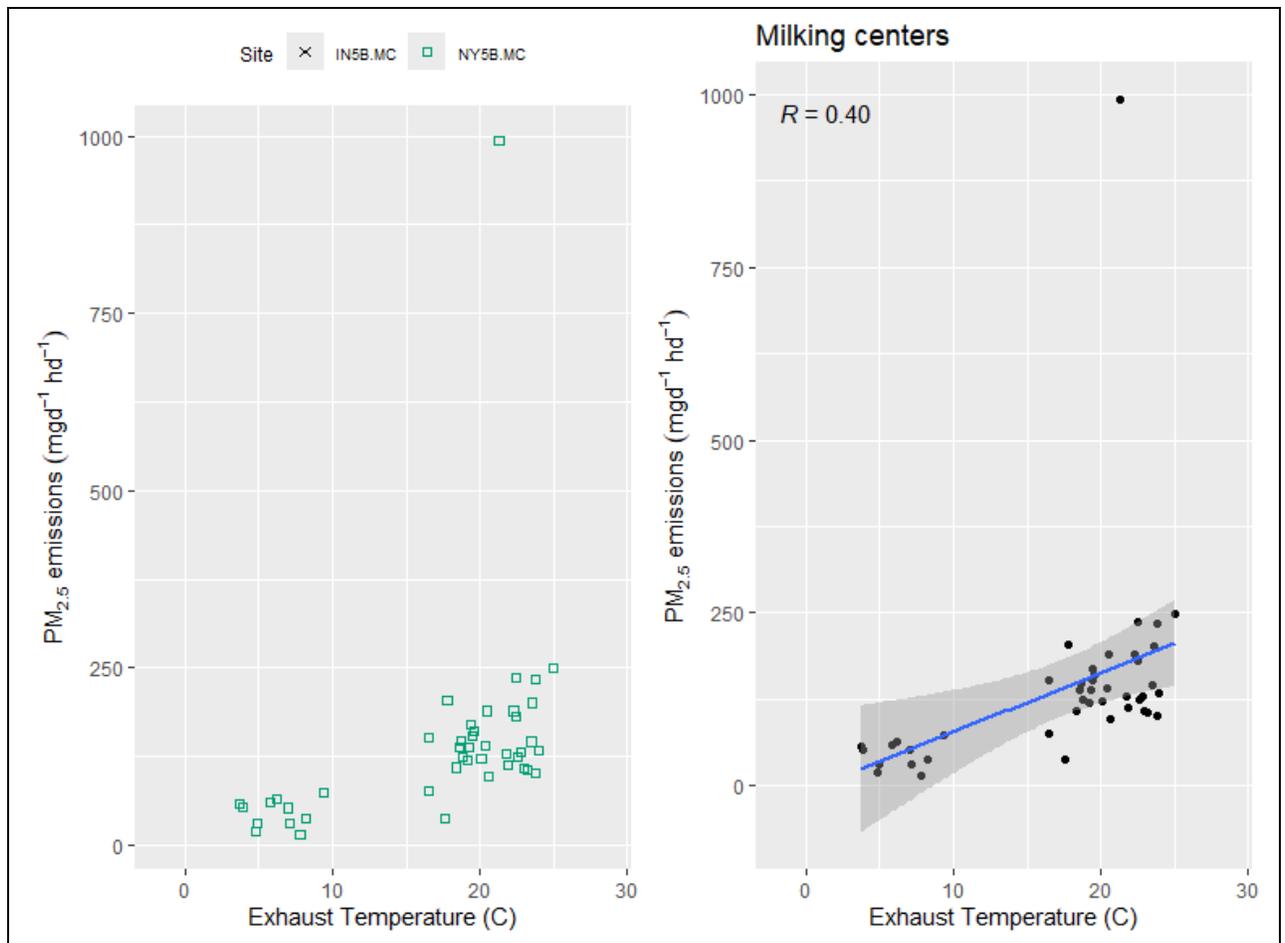


Figure 2.44: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

2.1.4.5 Exhaust relative humidity

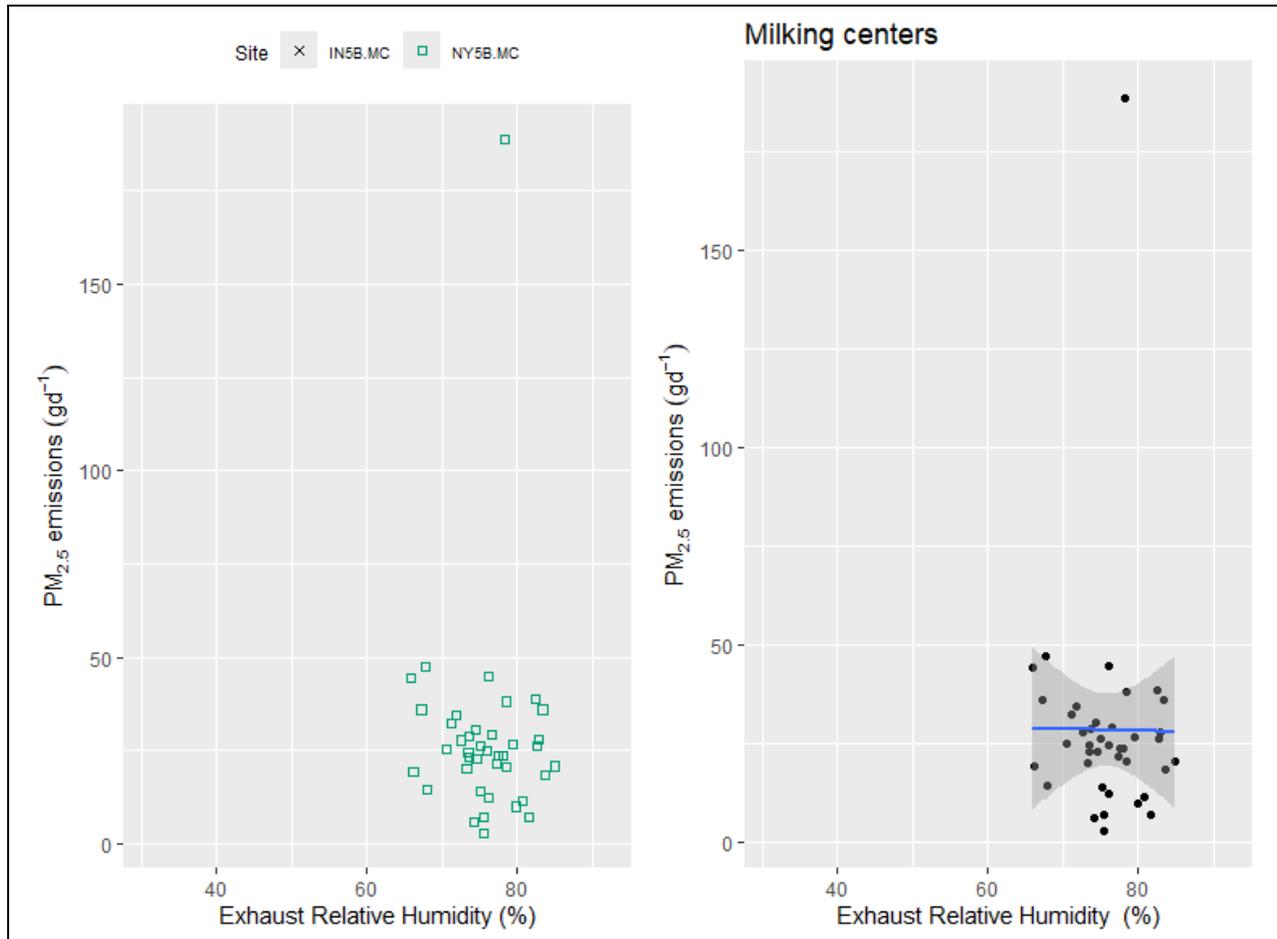


Figure 2.45: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus exhaust relative humidity.

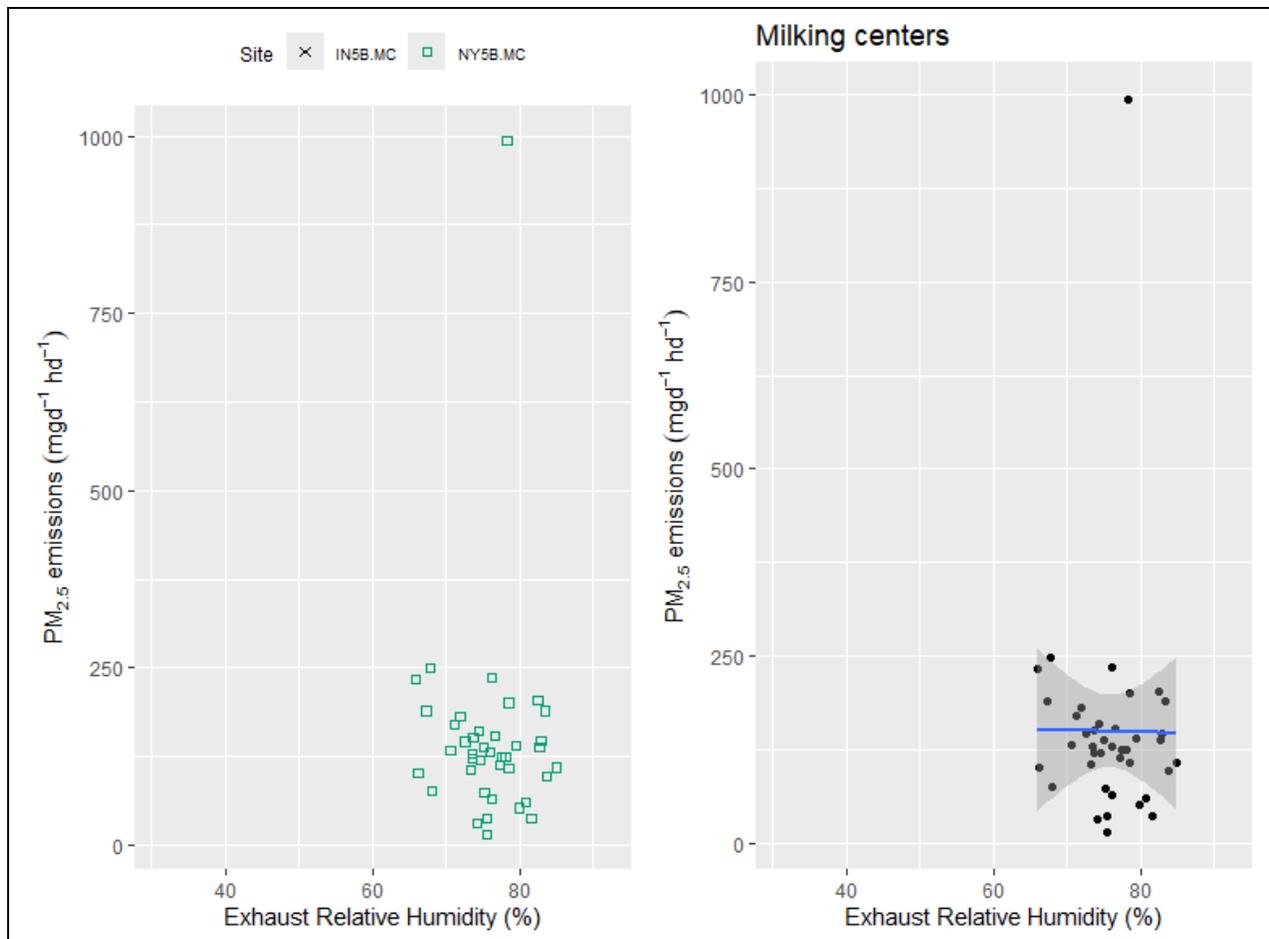


Figure 2.46: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

2.1.4.6 Airflow

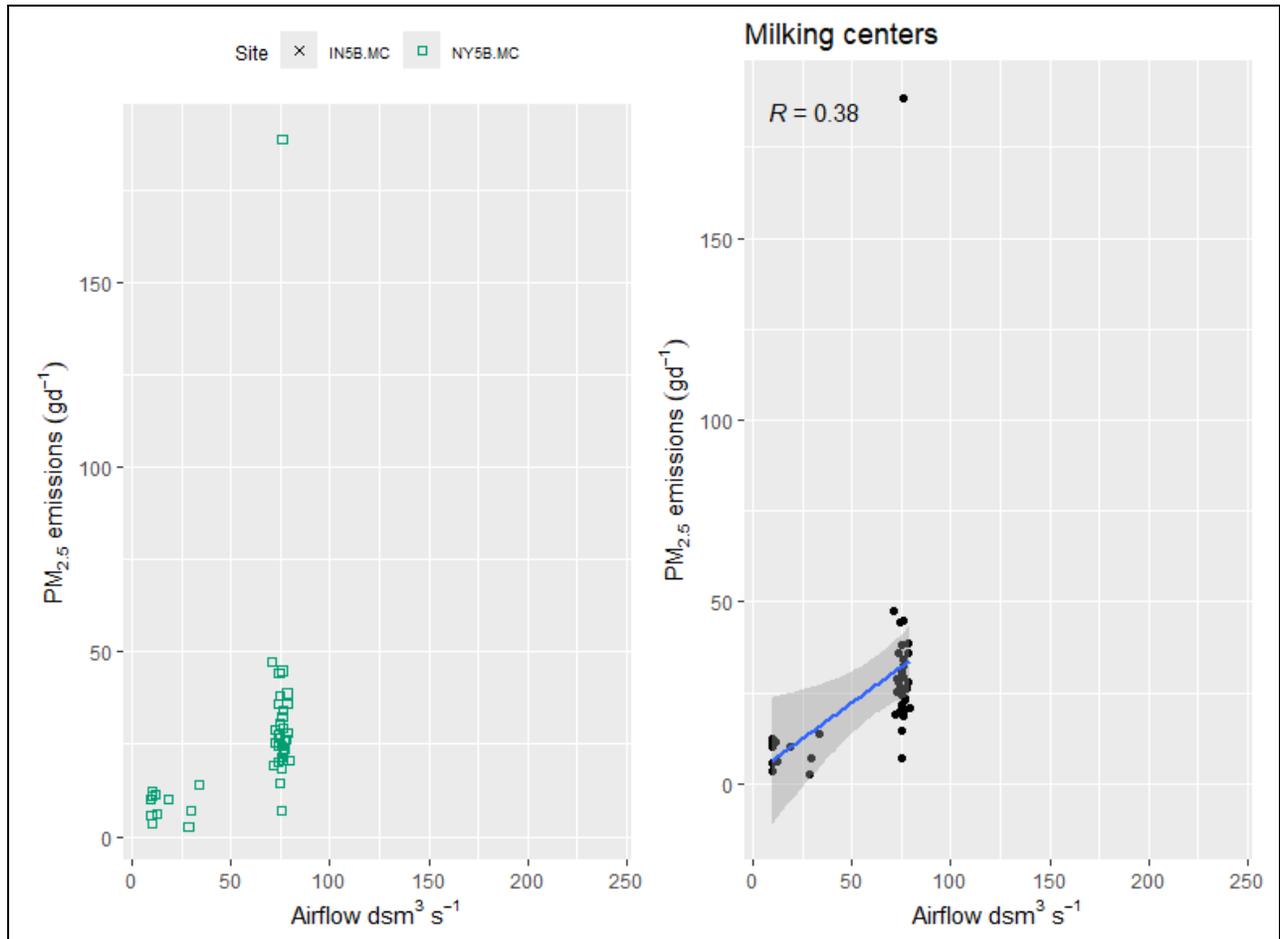


Figure 2.47: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus airflow.

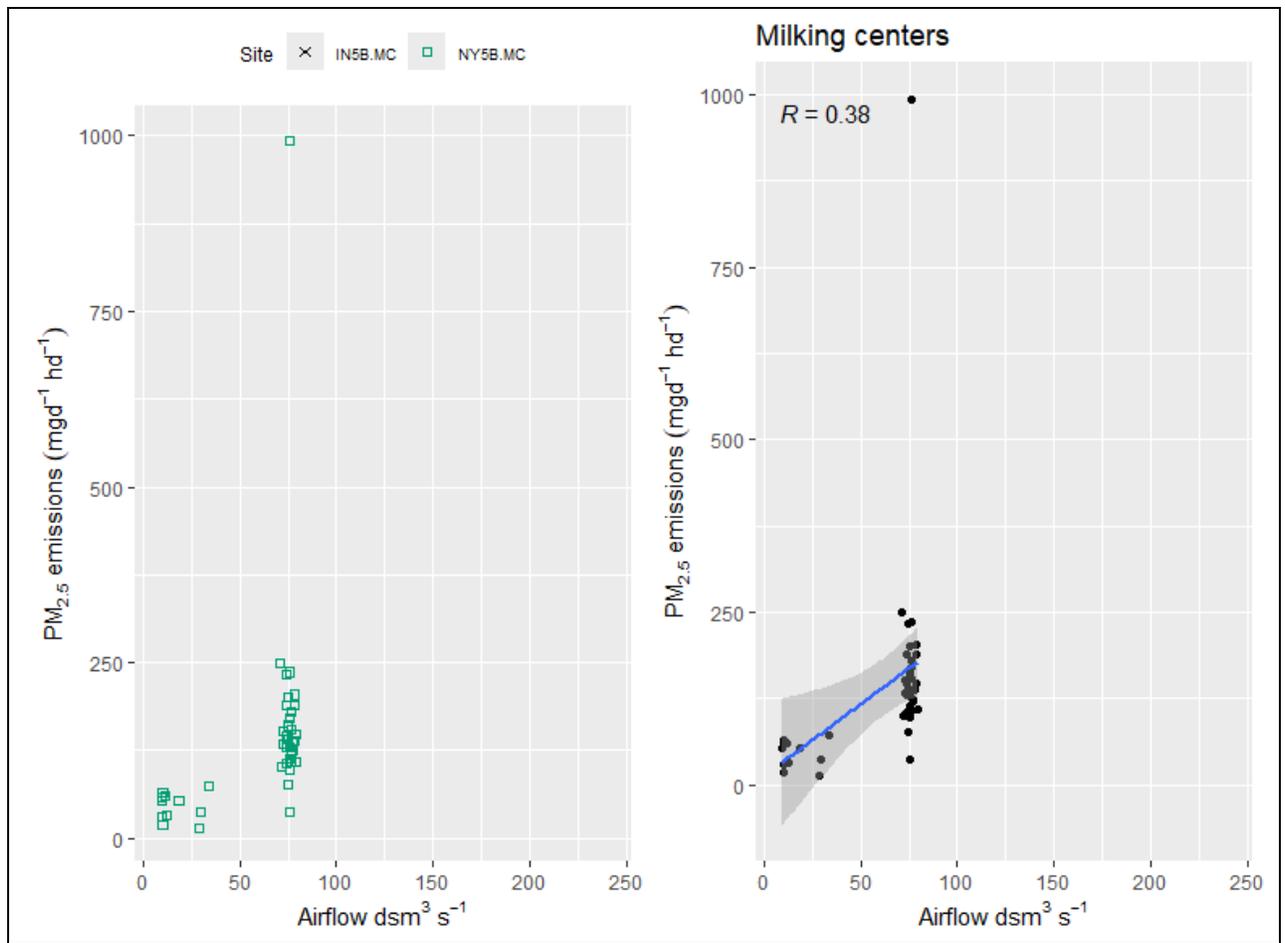
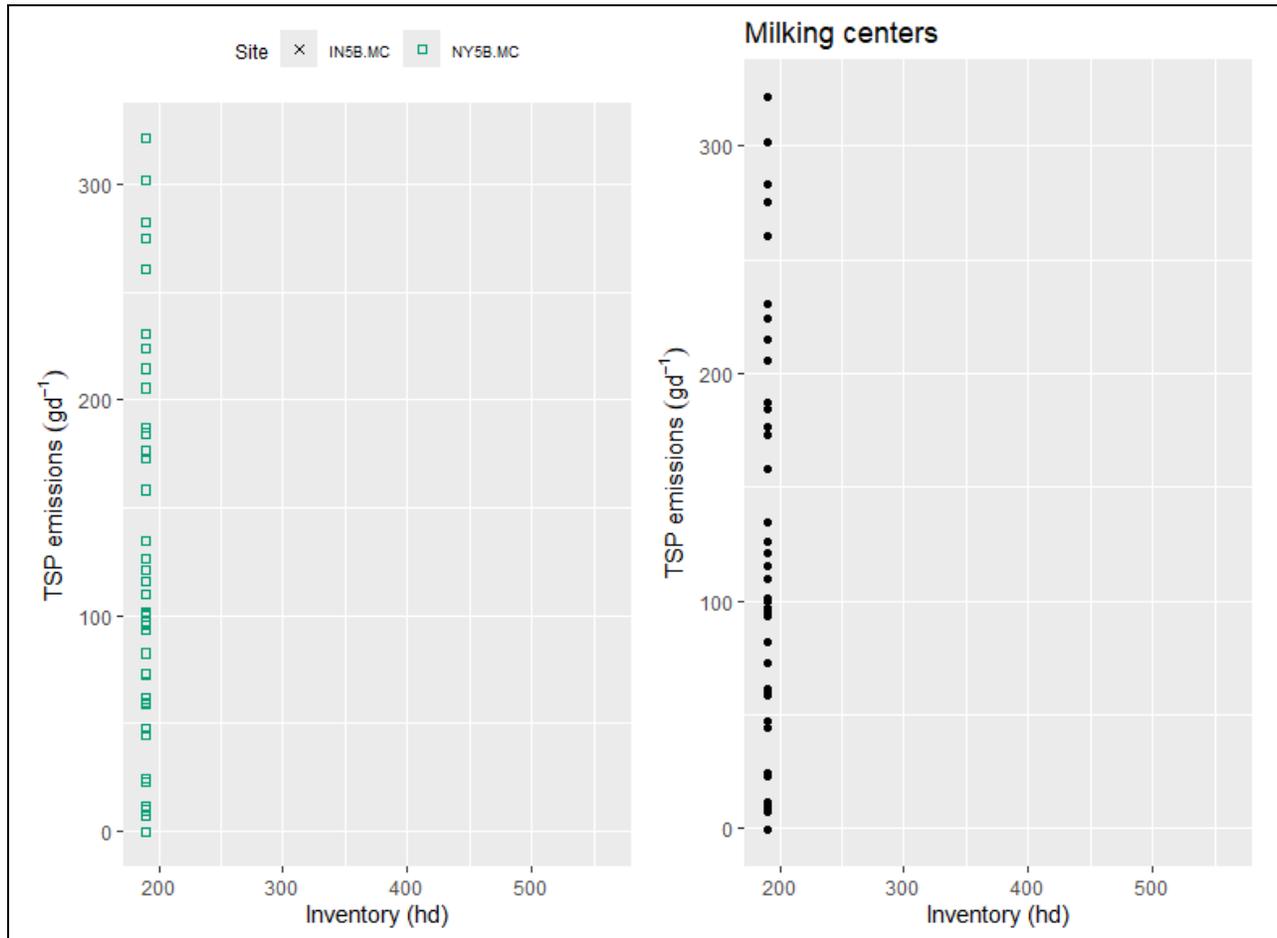


Figure 2.48: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus airflow.

2.1.5 Total Suspended Particulates (TSP)

2.1.5.1 Inventory



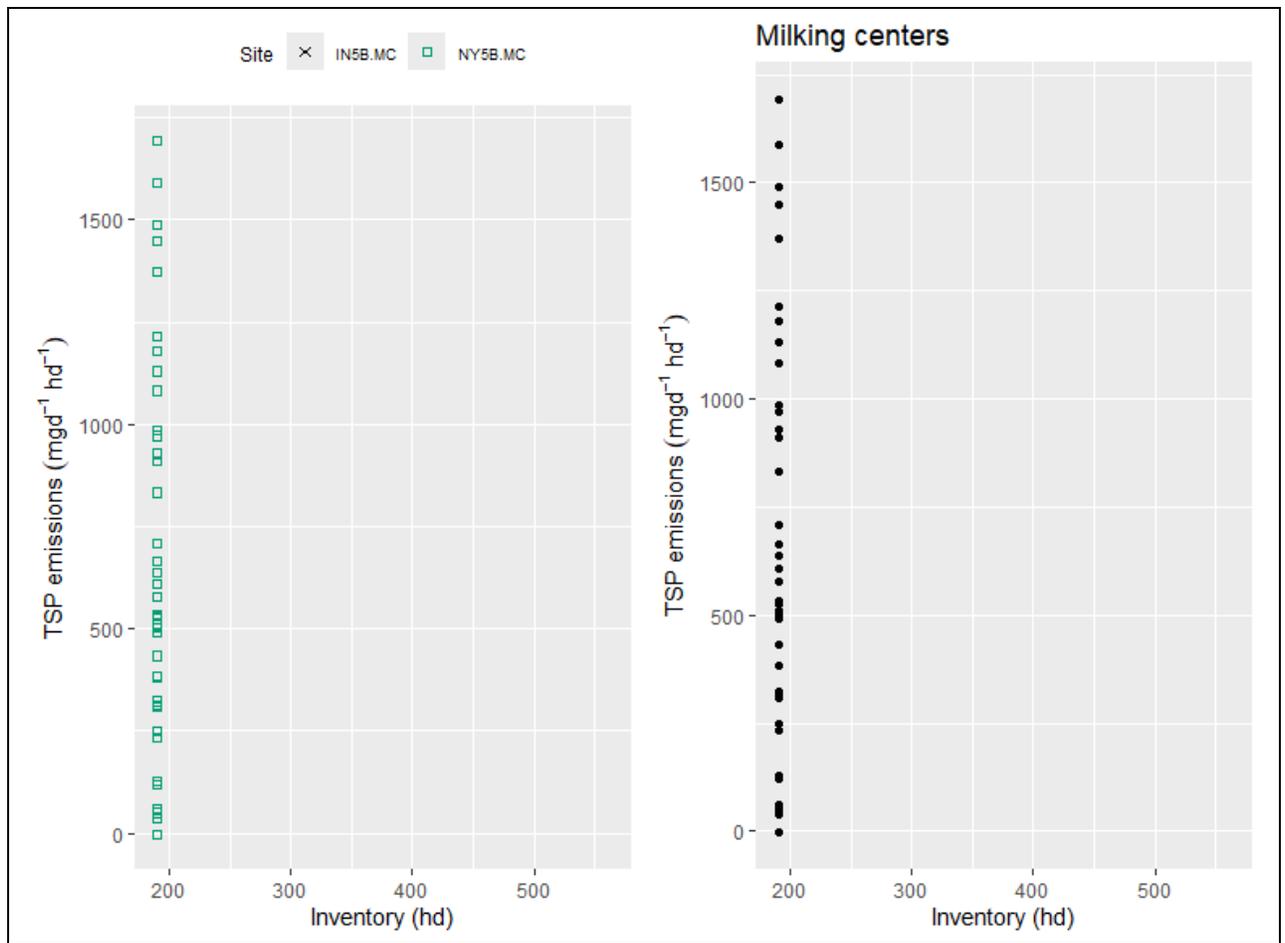


Figure 2.50: Scatter plot of milking centers TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus Inventory.

2.1.5.2 Average animal weight

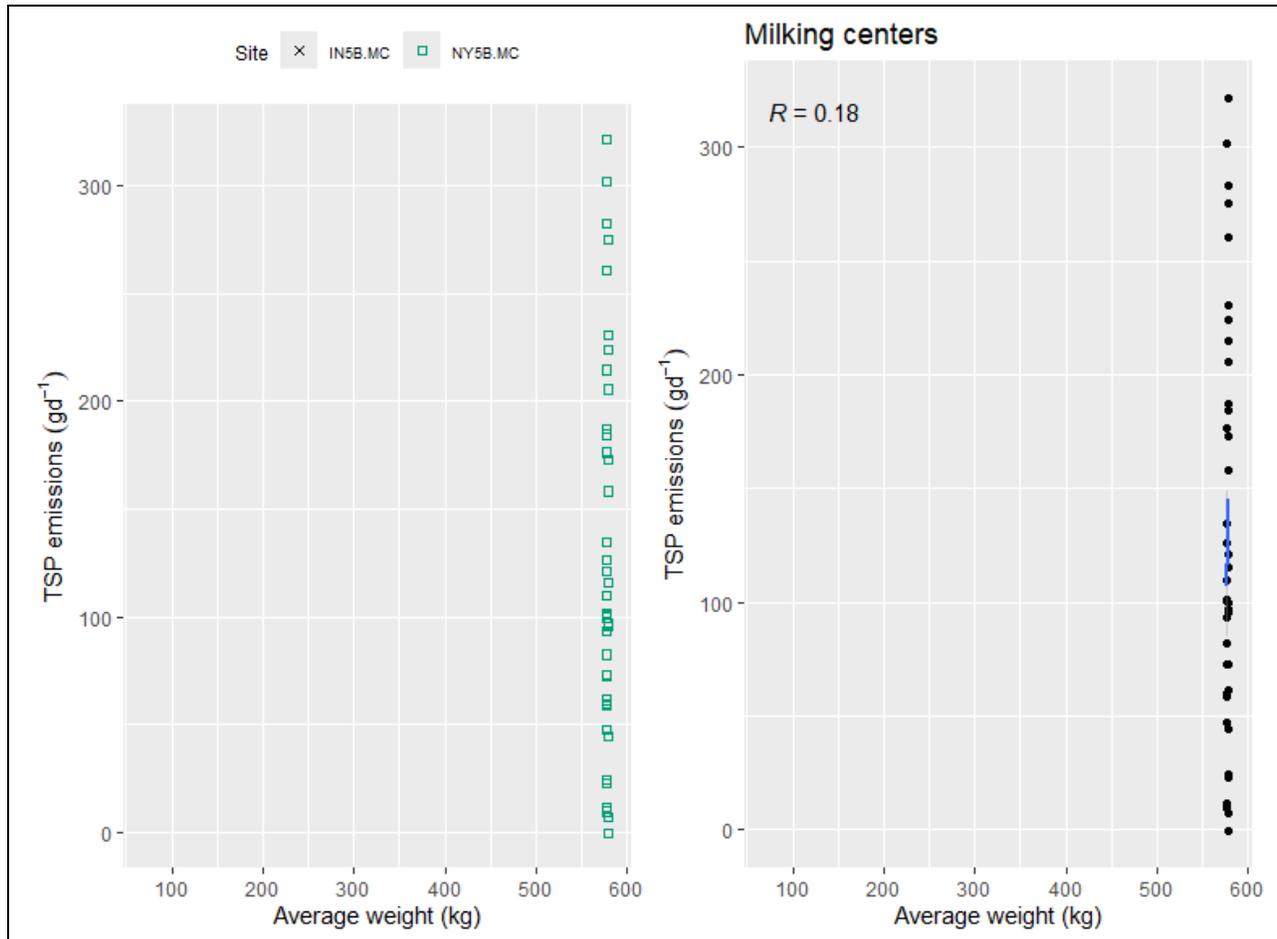


Figure 2.51: Scatter plot of milking centers TSP emissions (g d^{-1}) versus average animal weight.

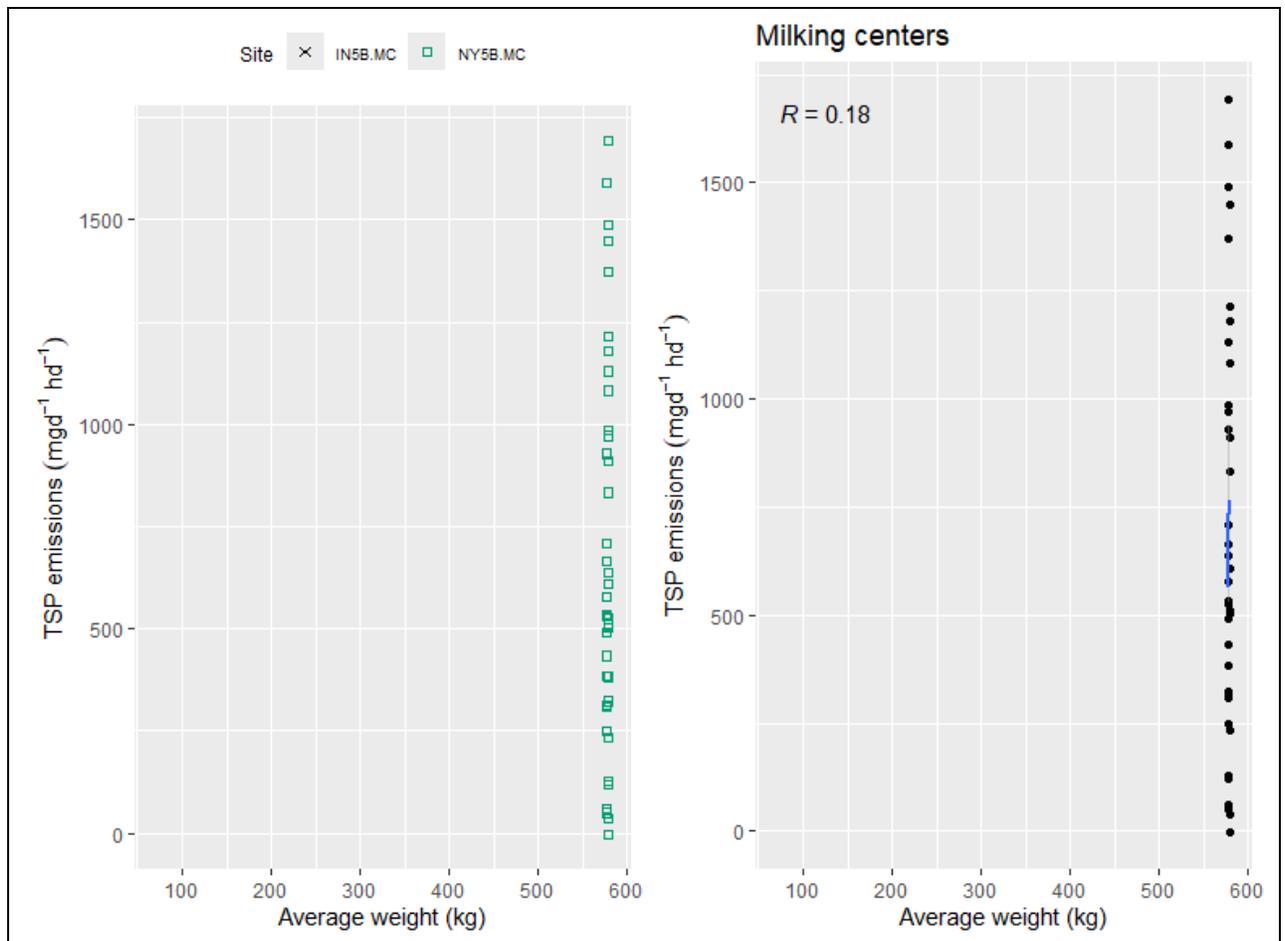


Figure 2.52: Scatter plot of milking centers TSP emissions (mg d⁻¹hd⁻¹) versus average animal weight.

2.1.5.3 *Live animal weight*

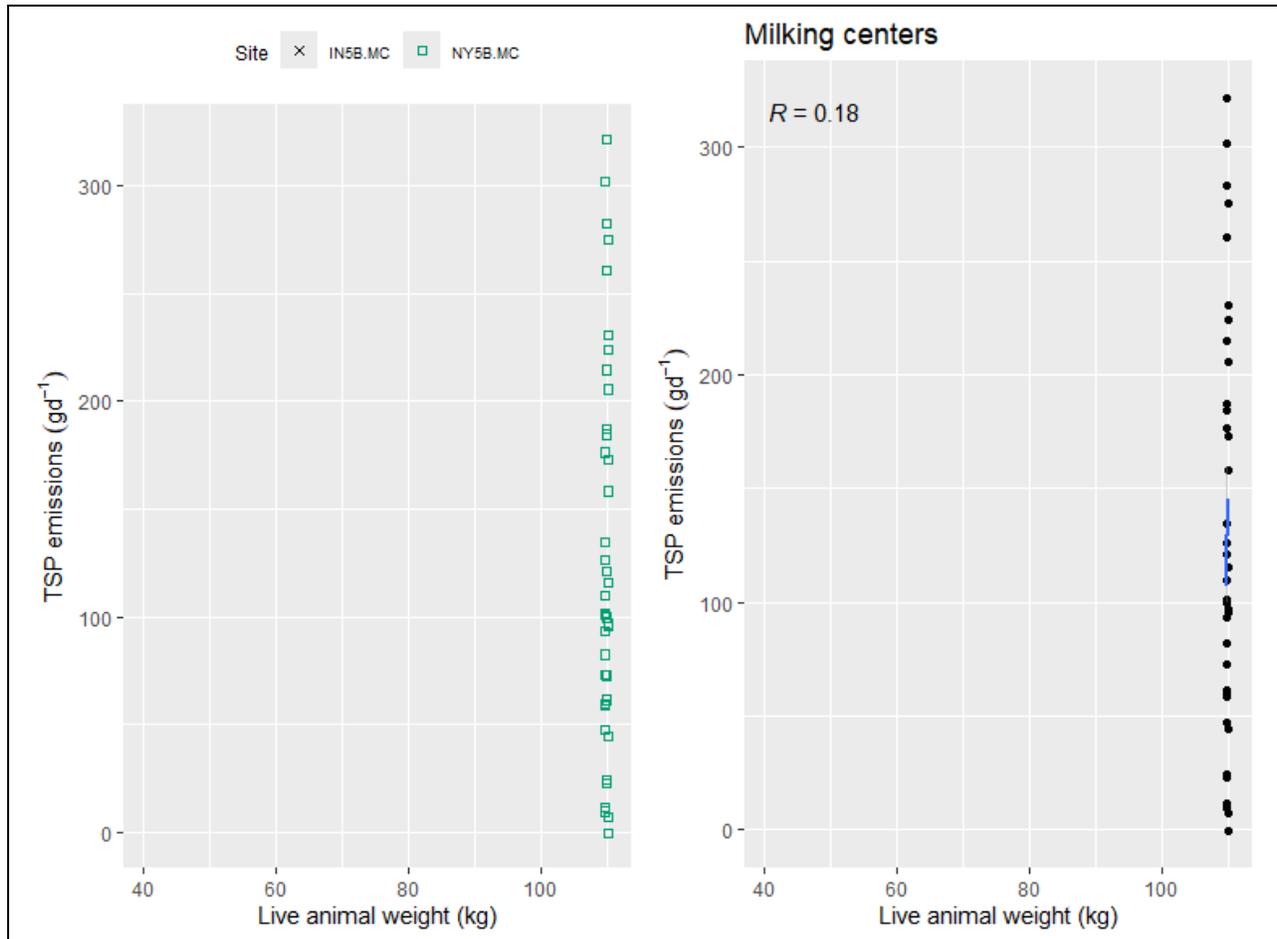


Figure 2.53: Scatter plot of milking centers TSP emissions (g d^{-1}) versus live animal weight.

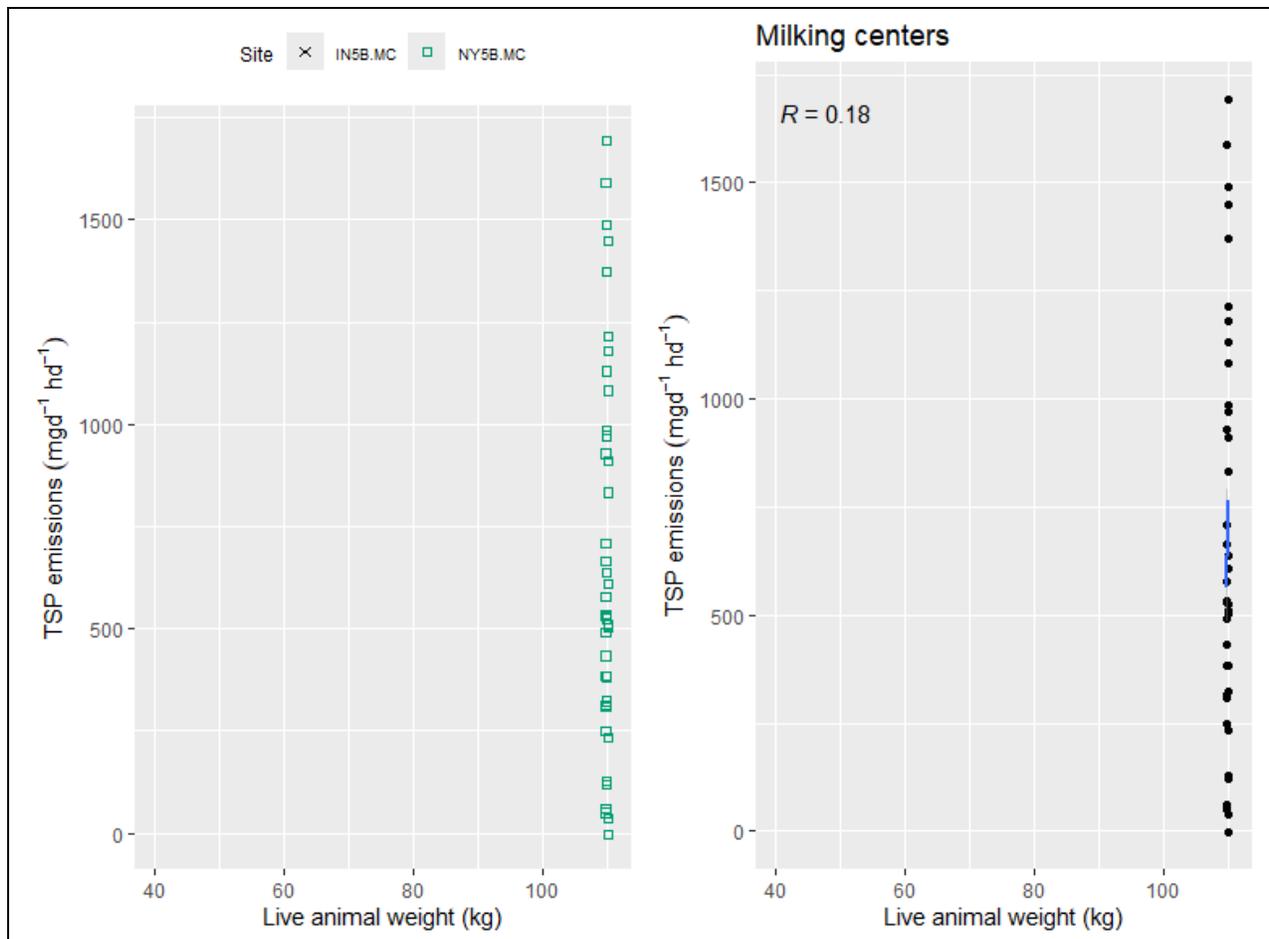


Figure 2.54: Scatter plot of milking centers TSP emissions (mg d⁻¹hd⁻¹) versus live animal weight.

2.1.5.4 Exhaust temperature

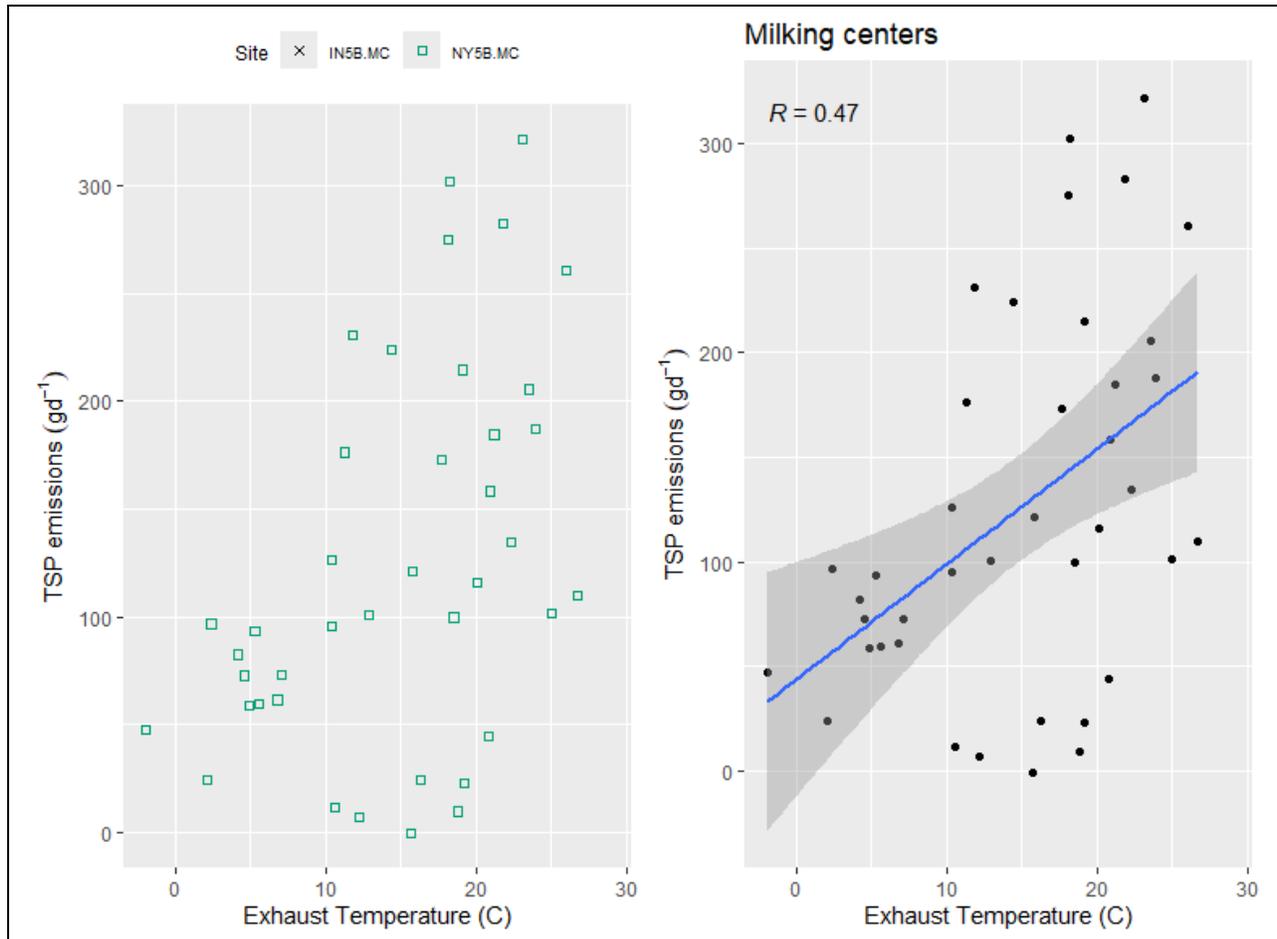


Figure 2.55: Scatter plot of milking centers TSP emissions (g d^{-1}) versus exhaust temperature.

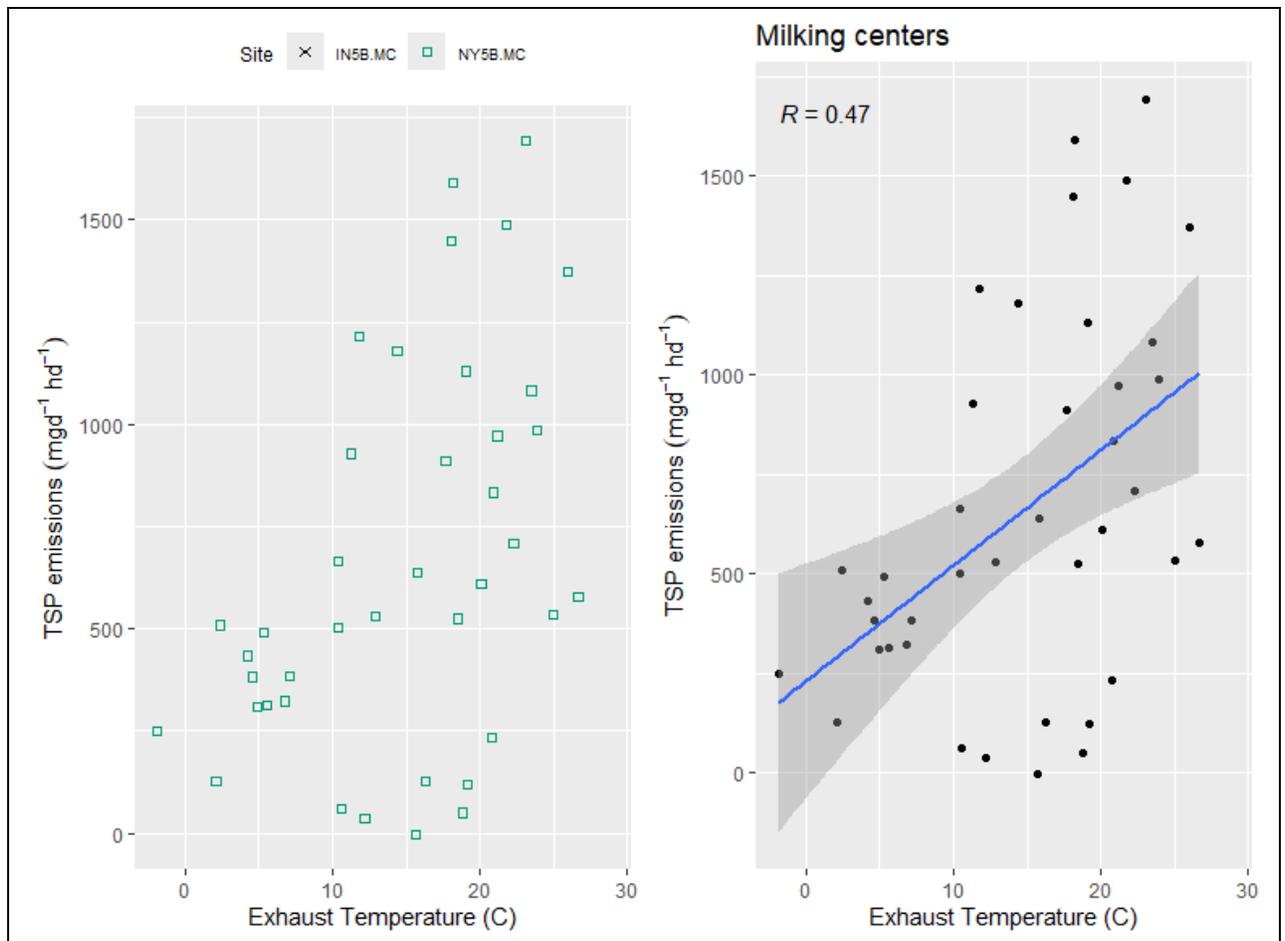


Figure 2.56: Scatter plot of milking centers TSP emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

2.1.5.5 Exhaust relative humidity

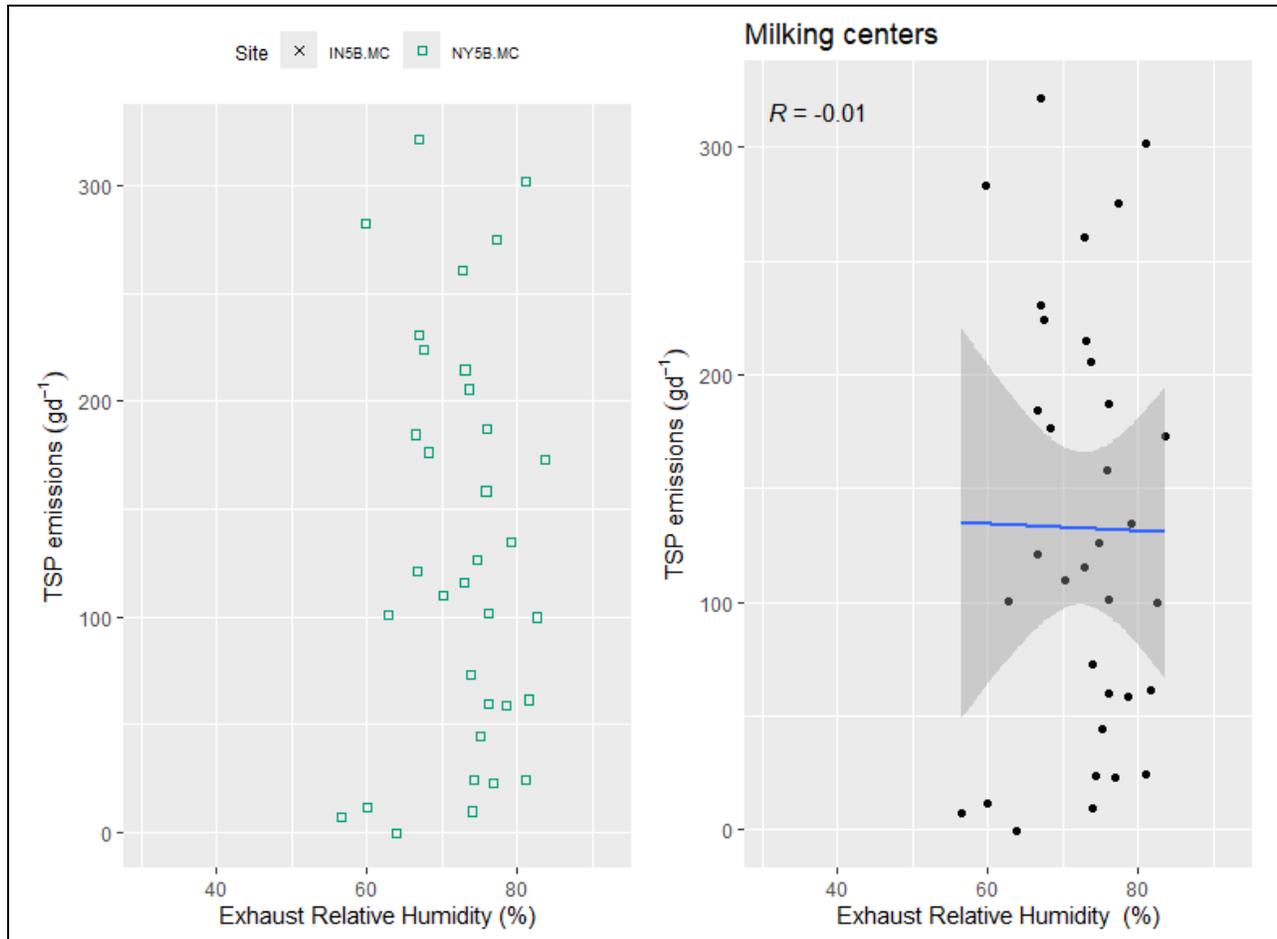


Figure 2.57: Scatter plot of milking centers TSP emissions (g d^{-1}) versus exhaust relative humidity.

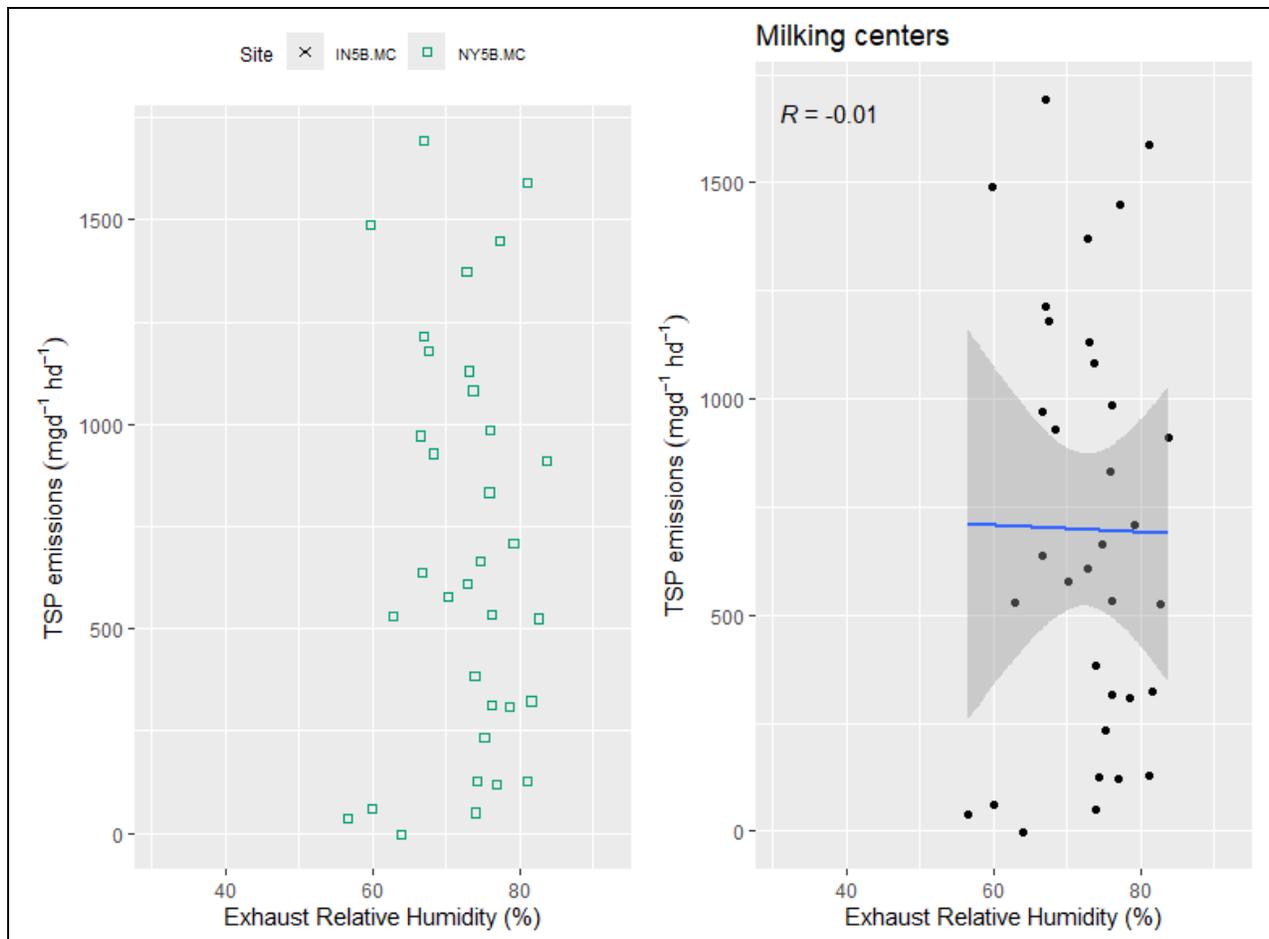


Figure 2.58: Scatter plot of milking centers TSP emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

2.1.5.6 Airflow

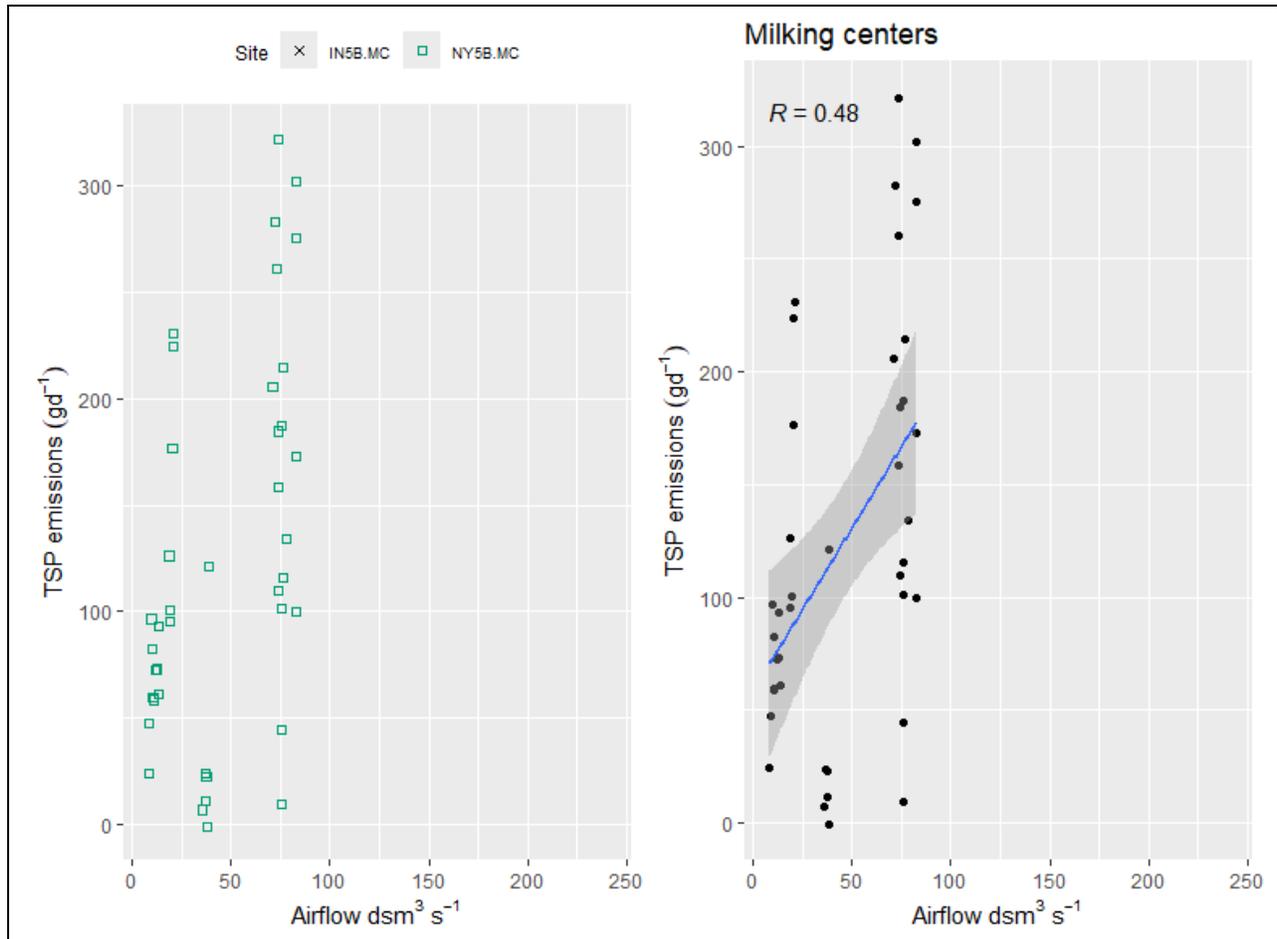


Figure 2.59: Scatter plot of milking centers TSP emissions (g d⁻¹) versus airflow.

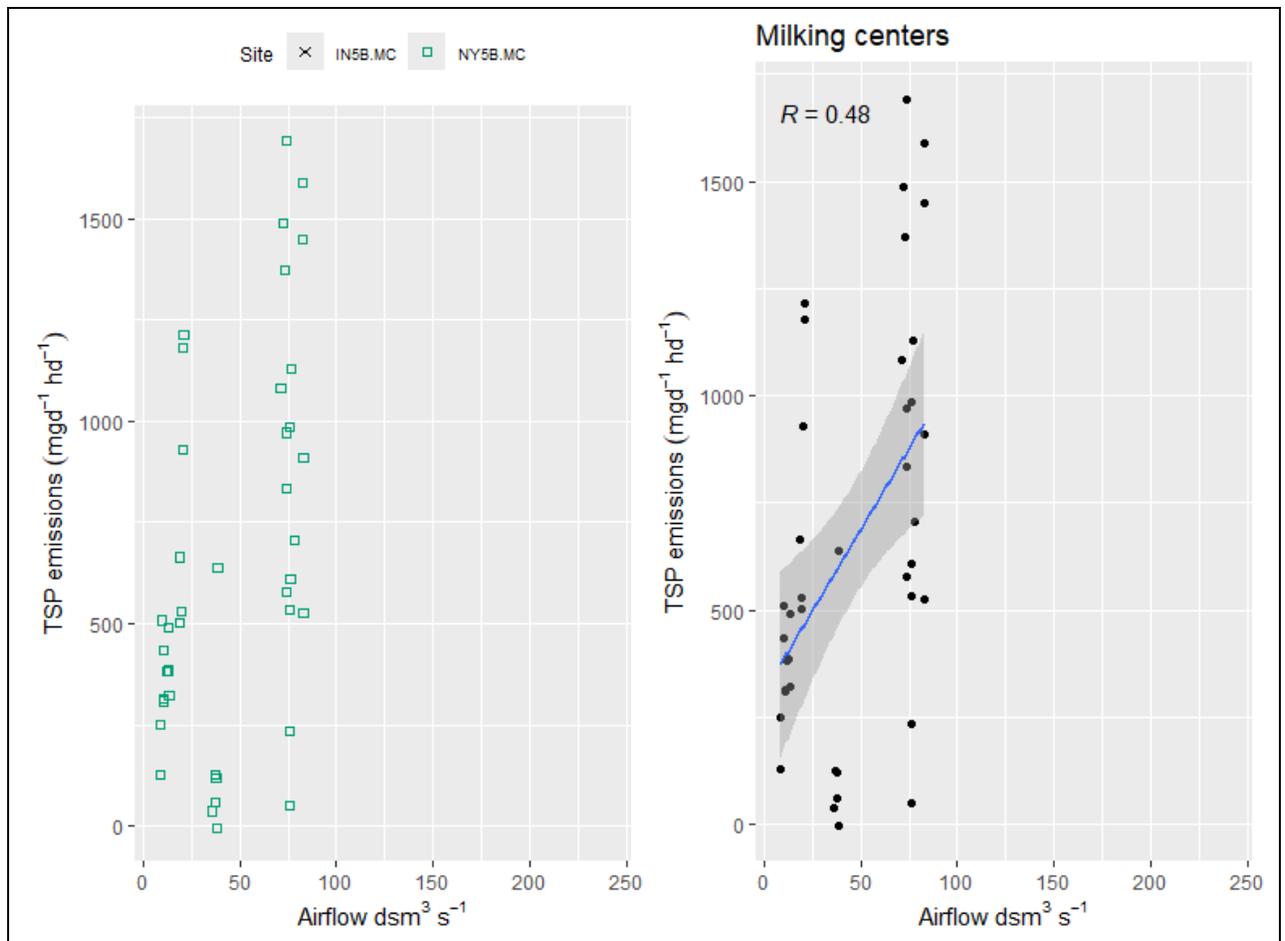


Figure 2.60: Scatter plot of milking centers TSP emissions (mg d⁻¹hd⁻¹) versus airflow.

2.2 Ambient

Table 2.2: Summary of milking centers R² values for ambient parameters.

Emissions	Parameter	R	R2	Strength
NH ₃ (kgd ⁻¹)	Ambient Temperature (C)	0.5	0.25	modest
H ₂ S (gd ⁻¹)	Ambient Temperature (C)	0.3	0.09	slight or weak
PM ₁₀ (gd ⁻¹)	Ambient Temperature (C)	0.57	0.33	modest
PM _{2.5} (gd ⁻¹)	Ambient Temperature (C)	0.4	0.16	slight or weak
TSP (gd ⁻¹)	Ambient Temperature (C)	0.46	0.22	modest
NH ₃ (gd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.36	0.13	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.34	0.12	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.57	0.33	modest
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.4	0.16	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.46	0.22	modest
NH ₃ (kgd ⁻¹)	Ambient Relative humidity (%)	-0.04	0	slight or weak
H ₂ S (gd ⁻¹)	Ambient Relative humidity (%)	0.03	0	slight or weak
PM ₁₀ (gd ⁻¹)	Ambient Relative humidity (%)	-0.42	0.18	slight or weak
PM _{2.5} (gd ⁻¹)	Ambient Relative humidity (%)	0.04	0	slight or weak
TSP (gd ⁻¹)	Ambient Relative humidity (%)	-0.02	0	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	0.07	0	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	0.04	0	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.42	0.18	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	0.04	0	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.02	0	slight or weak

2.2.1 Ammonia (NH₃)

2.2.1.1 Ambient temperature

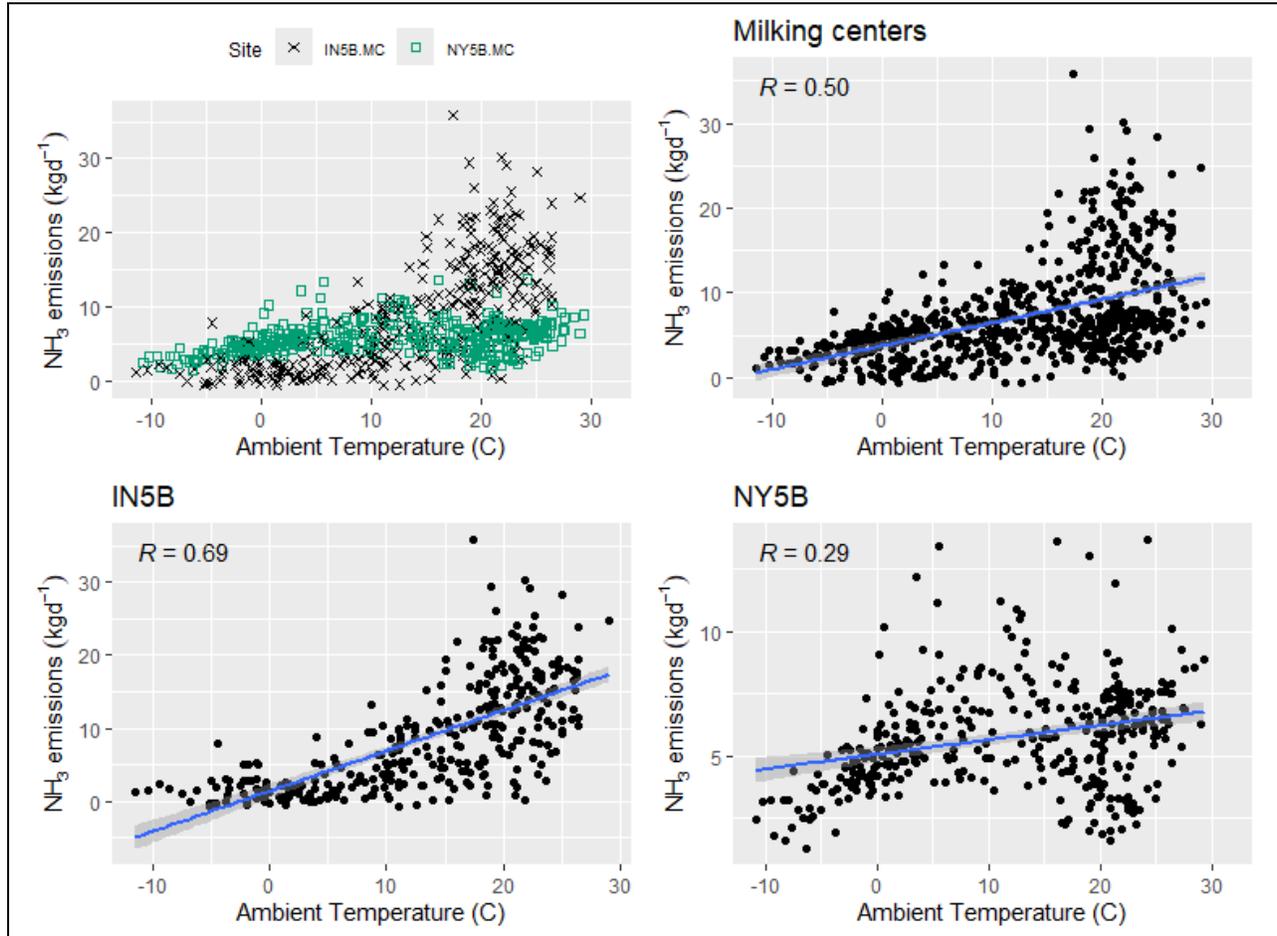


Figure 2.61: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus ambient temperature.

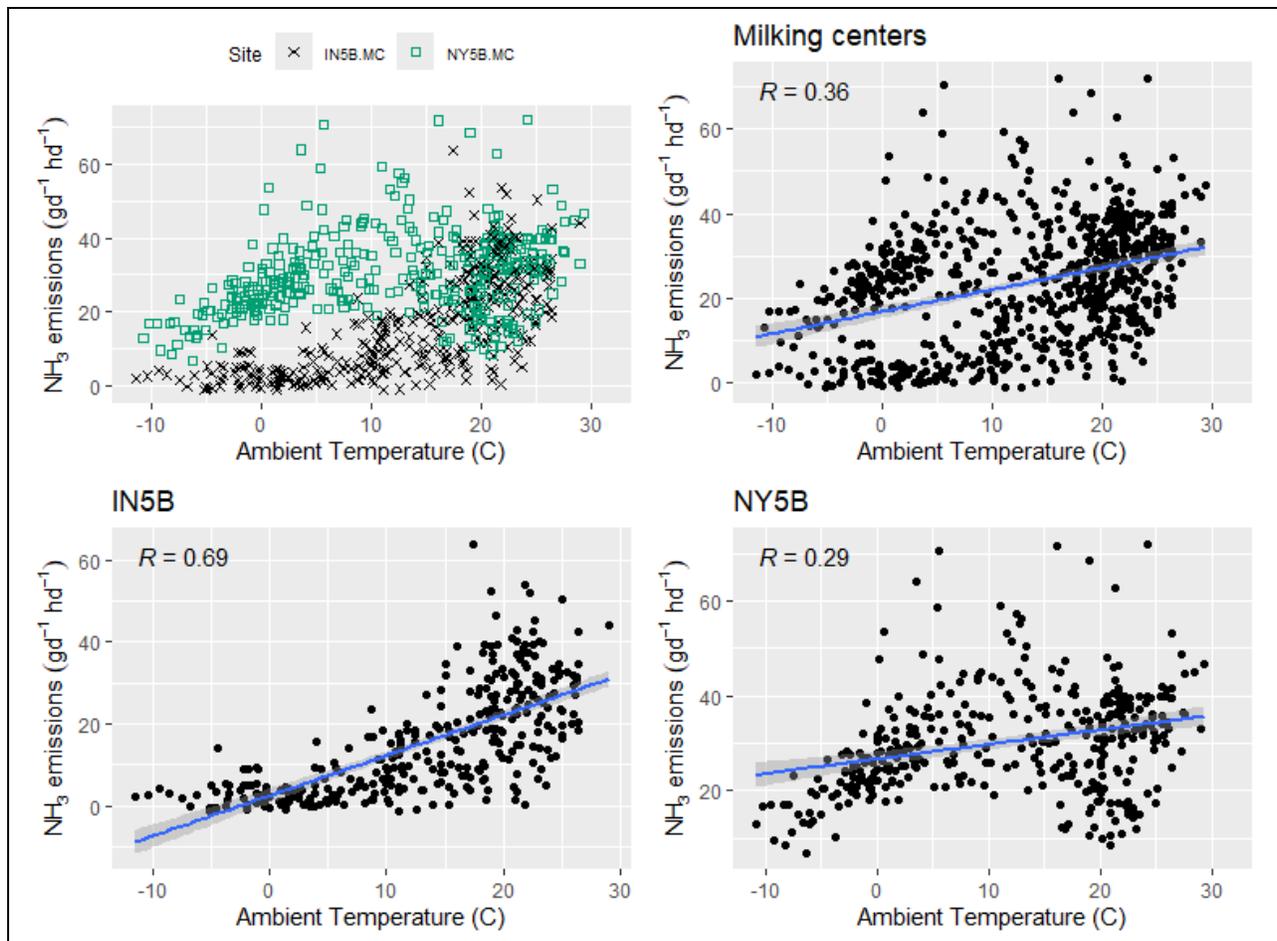


Figure 2.62: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus ambient temperature.

2.2.1.2 Ambient relative humidity

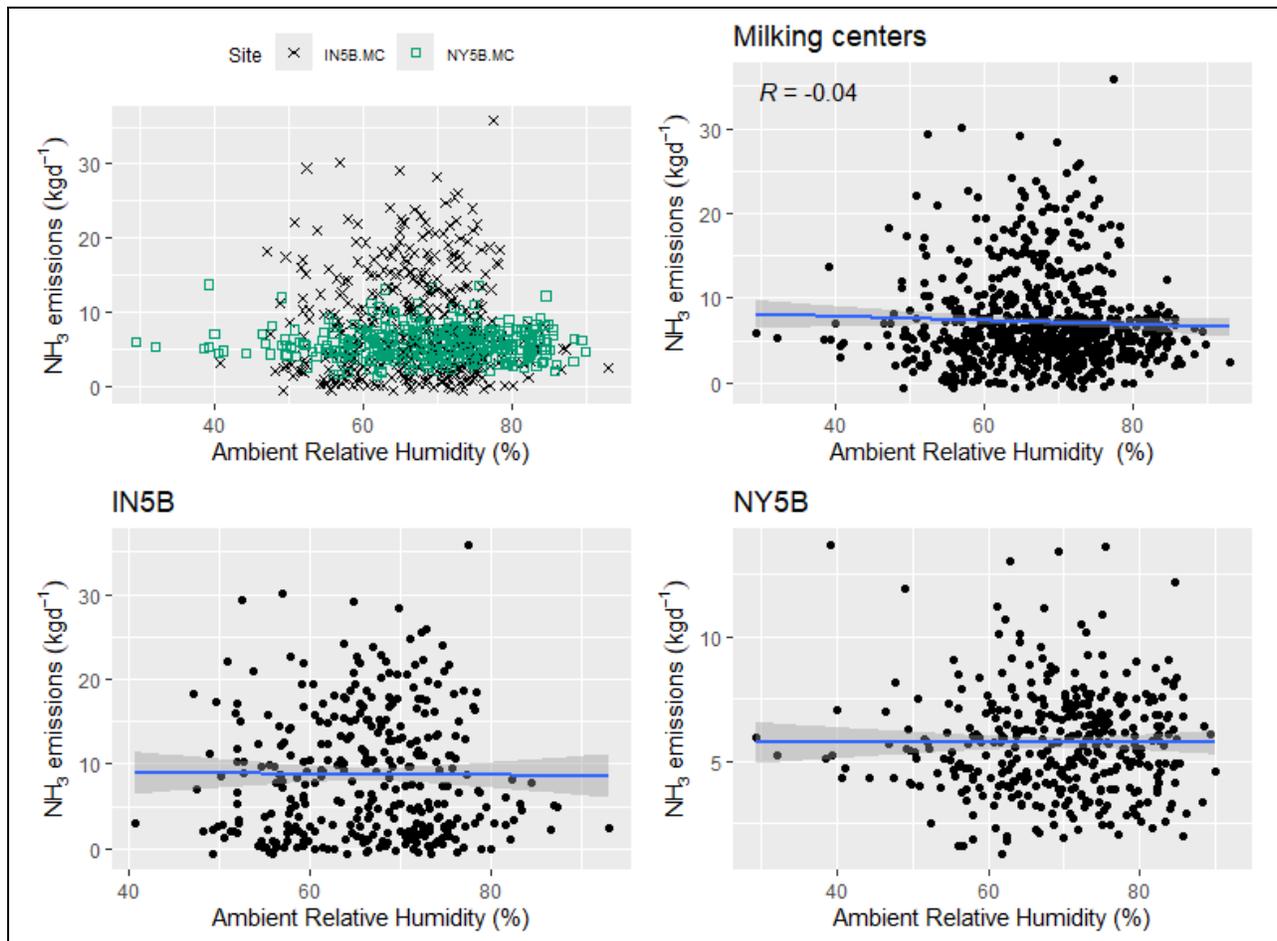


Figure 2.63: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus ambient relative humidity.

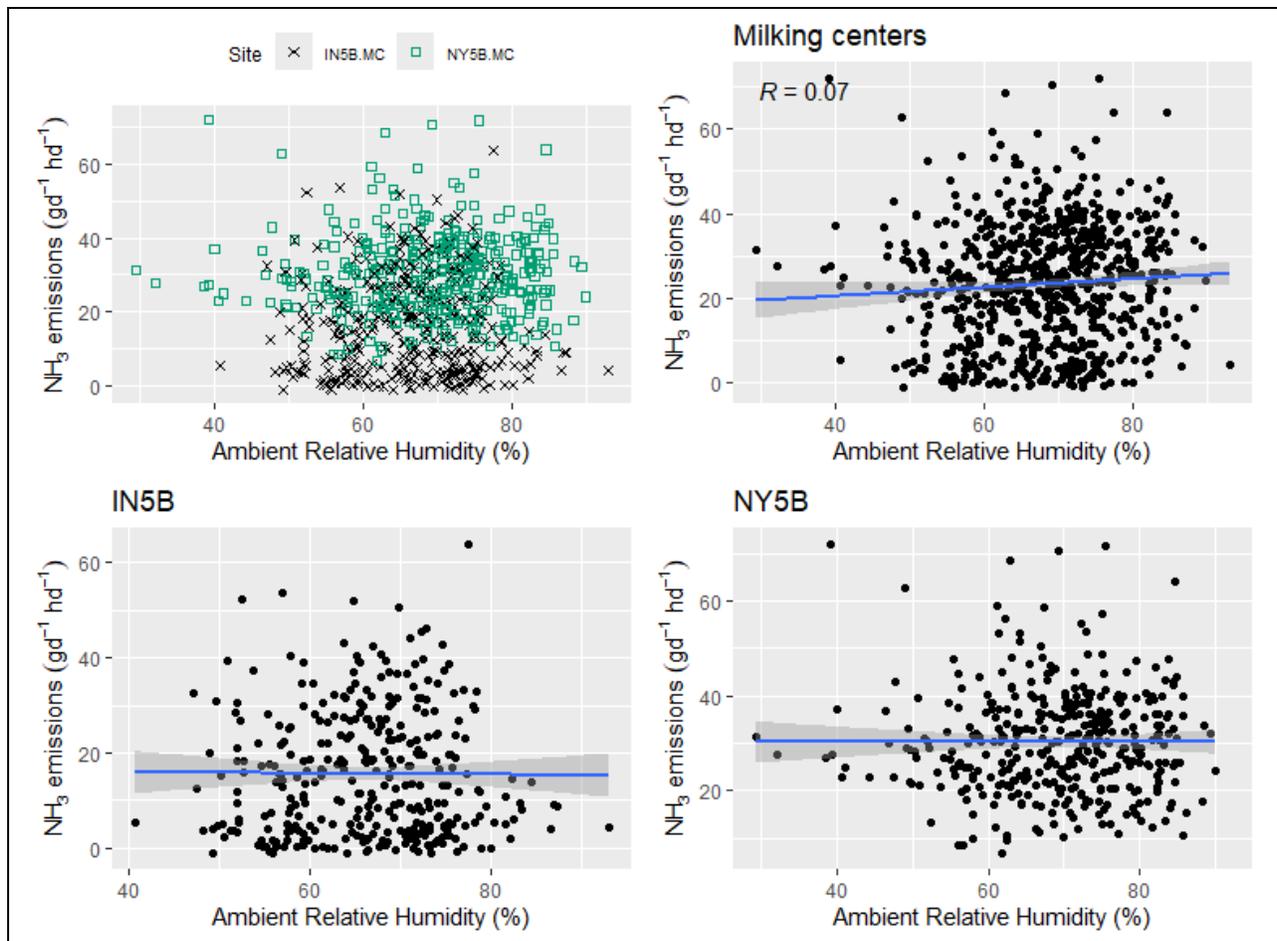


Figure 2.64: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus ambient relative humidity.

2.2.1.3 Air pressure

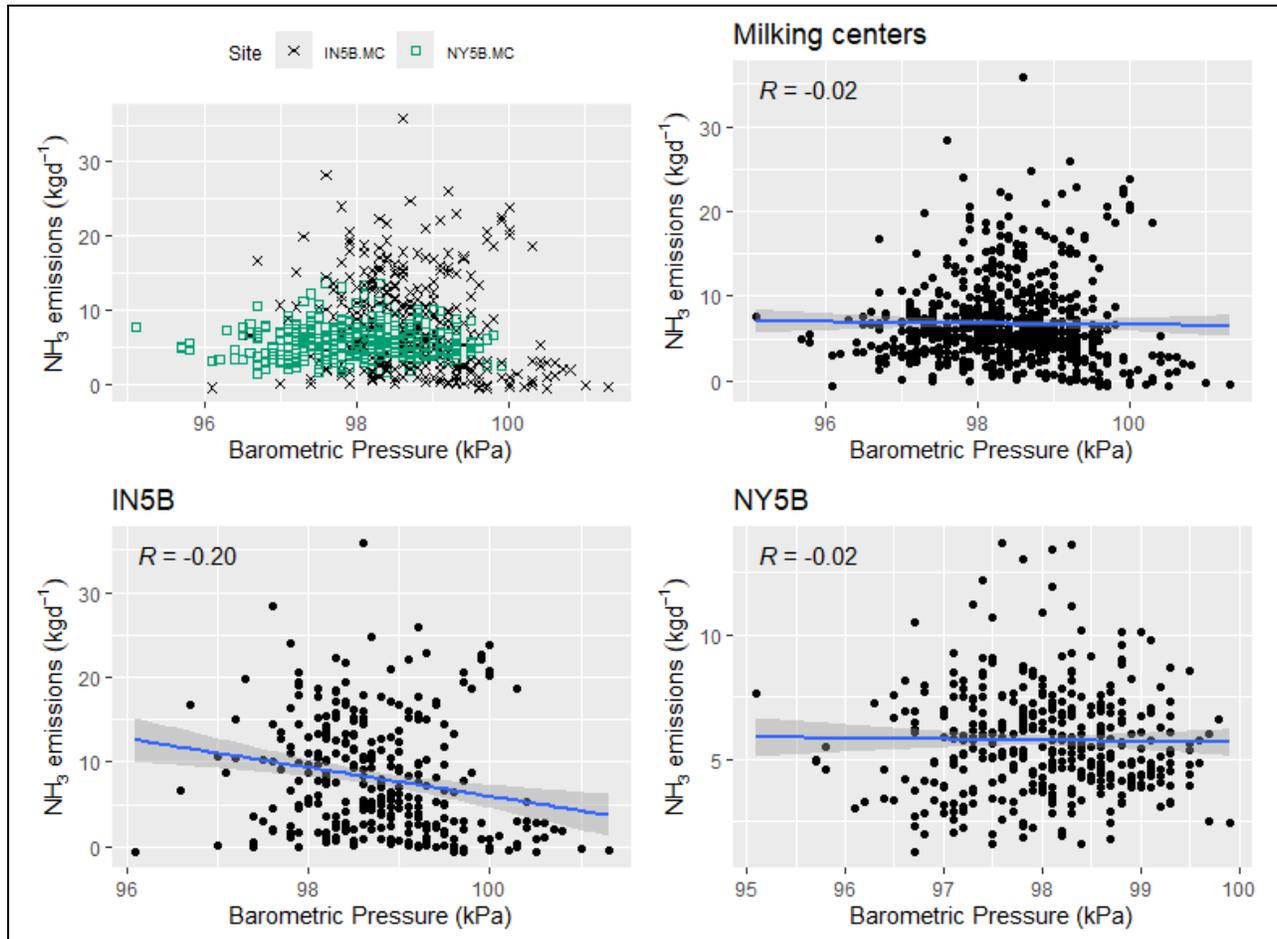


Figure 2.65: Scatter plot of milking centers NH₃ emissions (kg d⁻¹) versus air pressure.

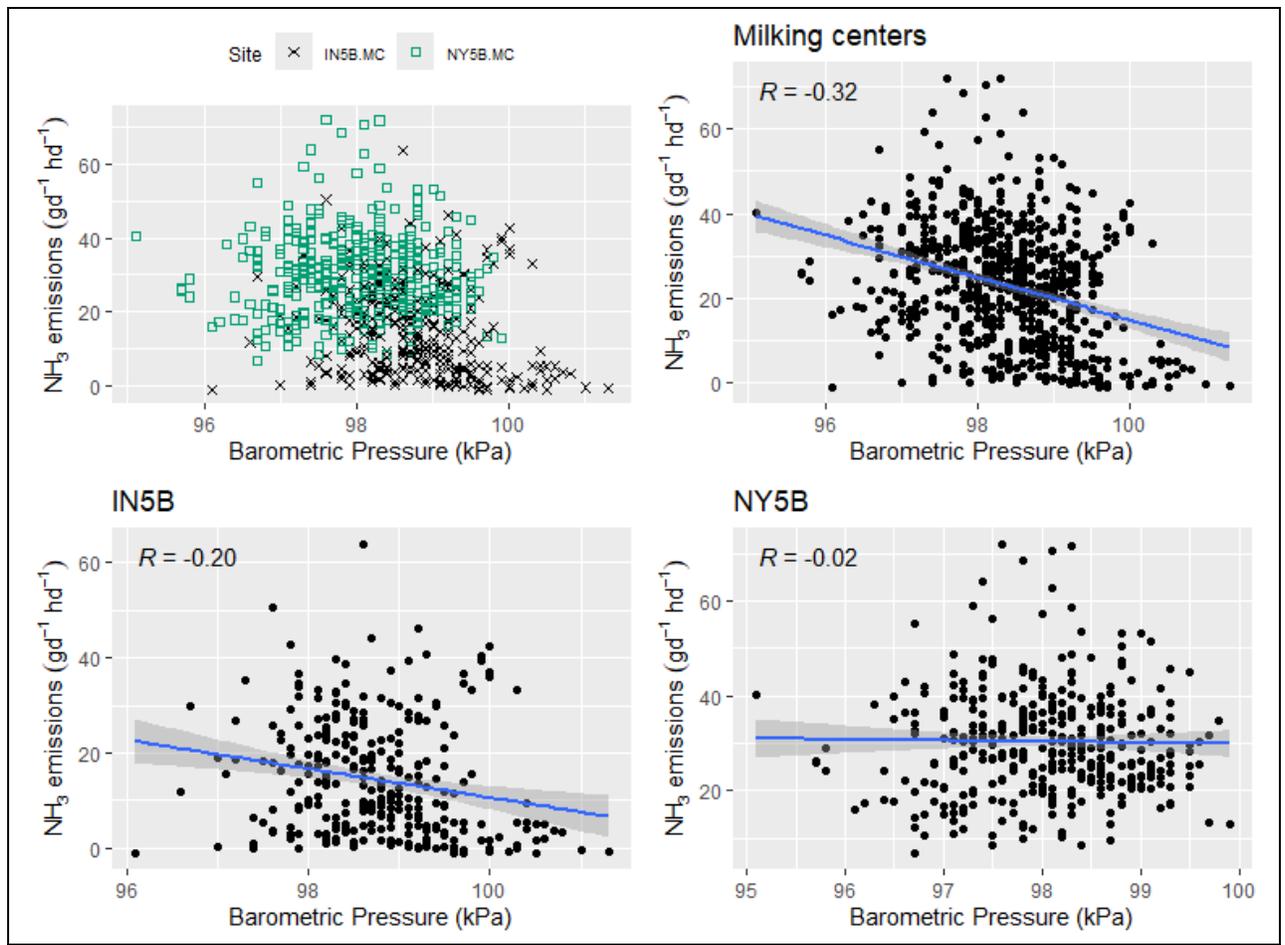


Figure 2.66: Scatter plot of milking centers NH₃ emissions (g d⁻¹hd⁻¹) versus air pressure.

2.2.2 Hydrogen Sulfide (H₂S)

2.2.2.1 Ambient temperature

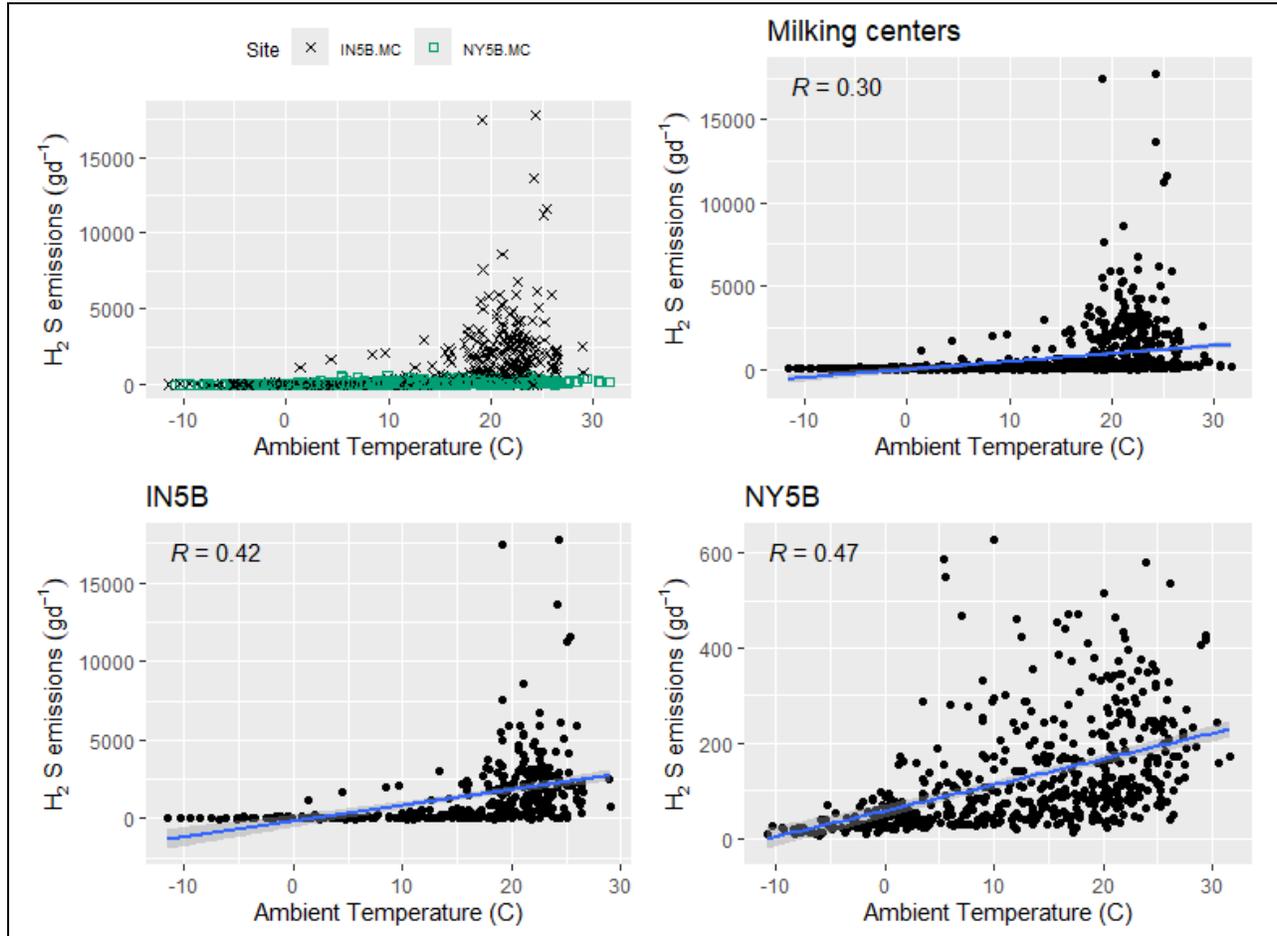


Figure 2.67: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus ambient temperature.

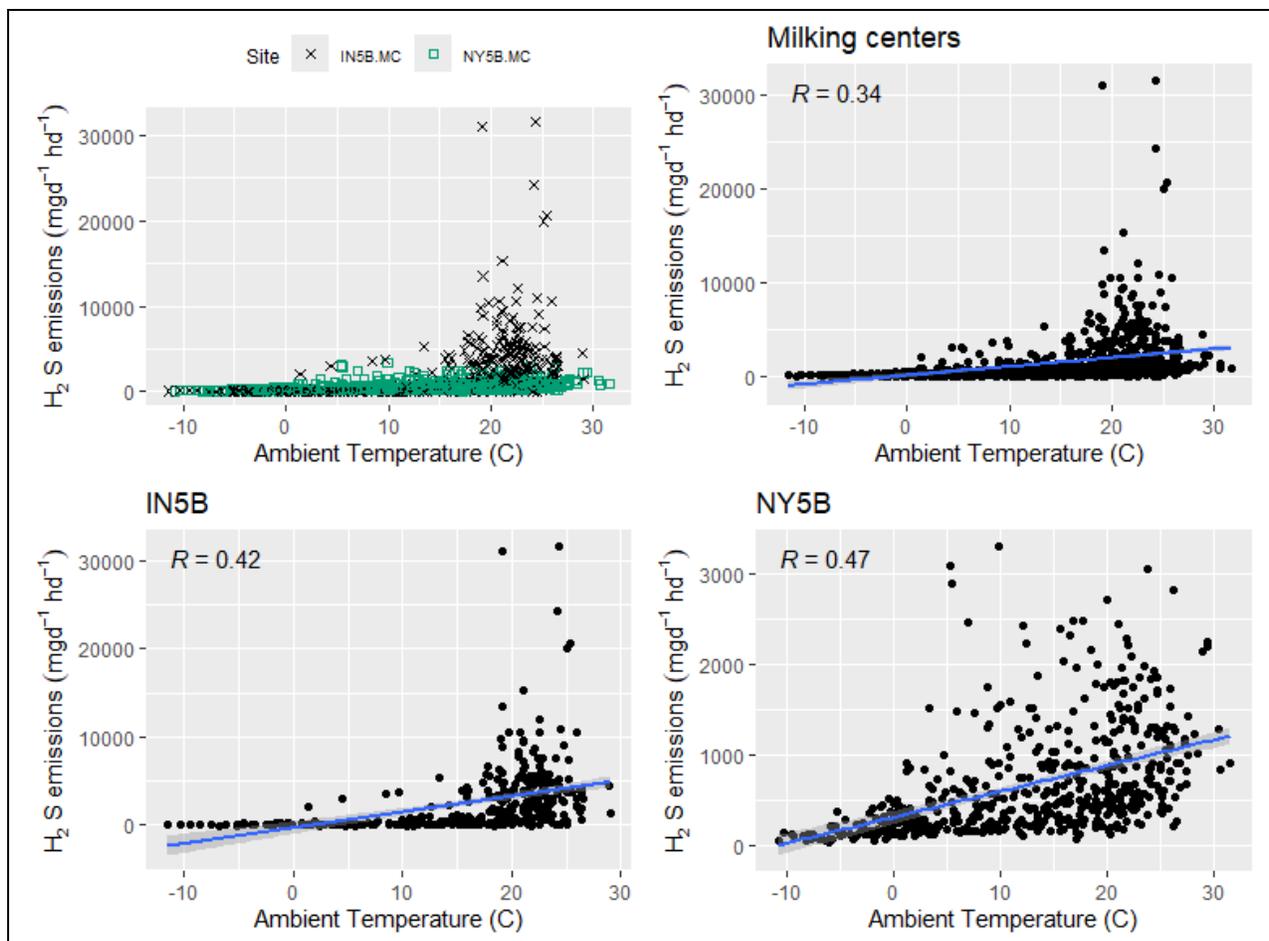


Figure 2.68: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

2.2.2.2 Ambient relative humidity

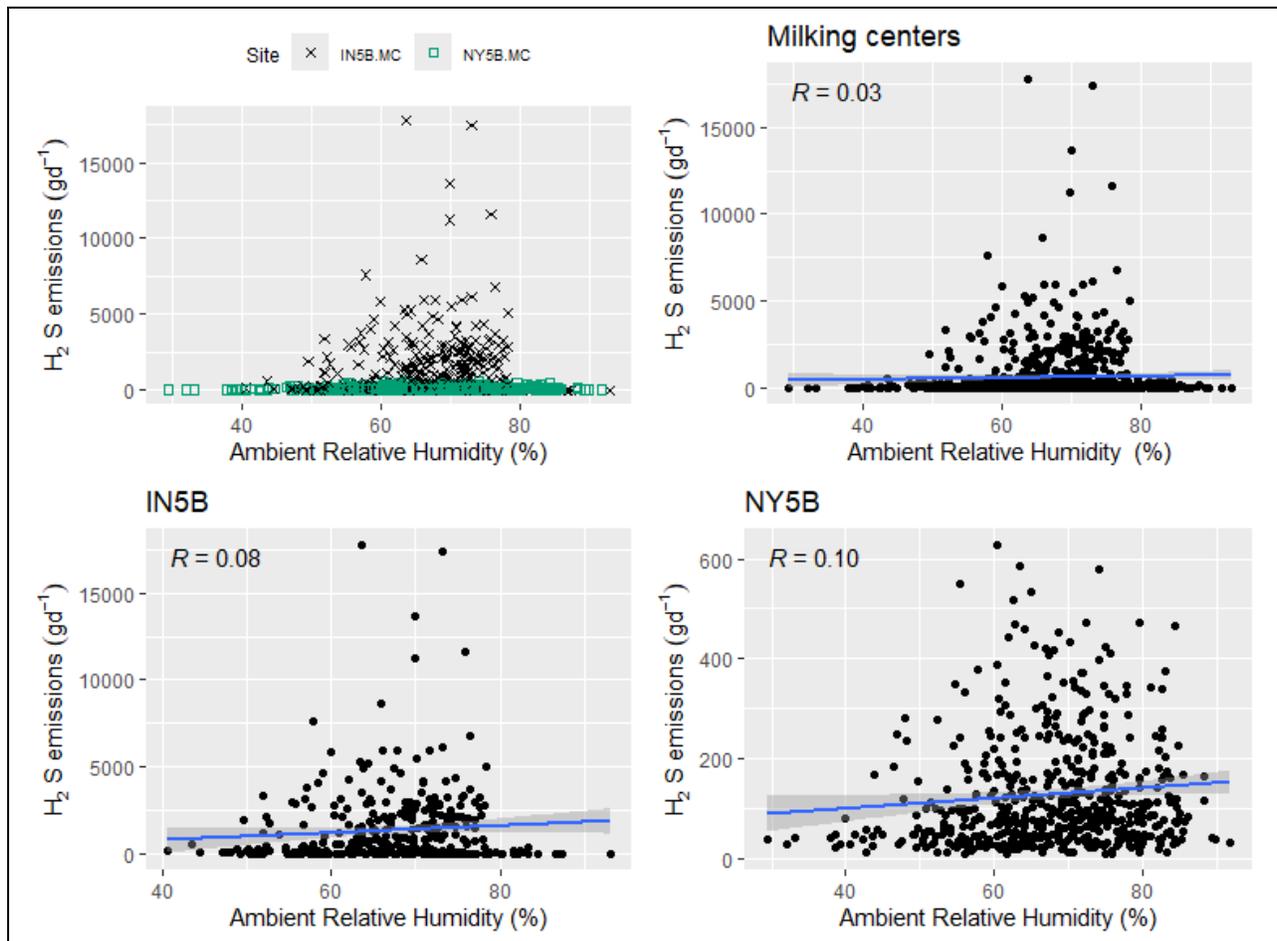


Figure 2.69: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus ambient relative humidity.

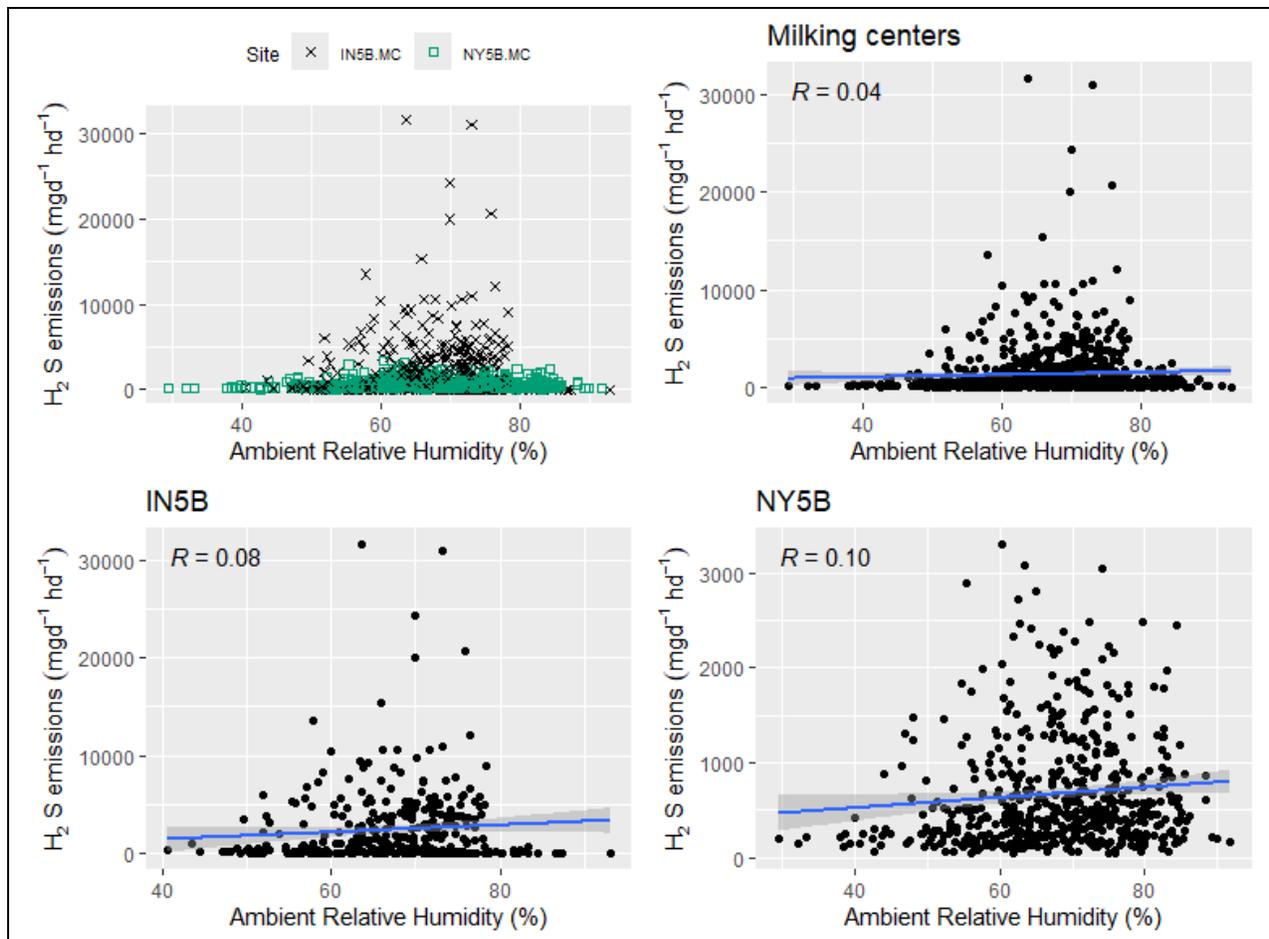


Figure 2.70: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

2.2.2.3 Air pressure

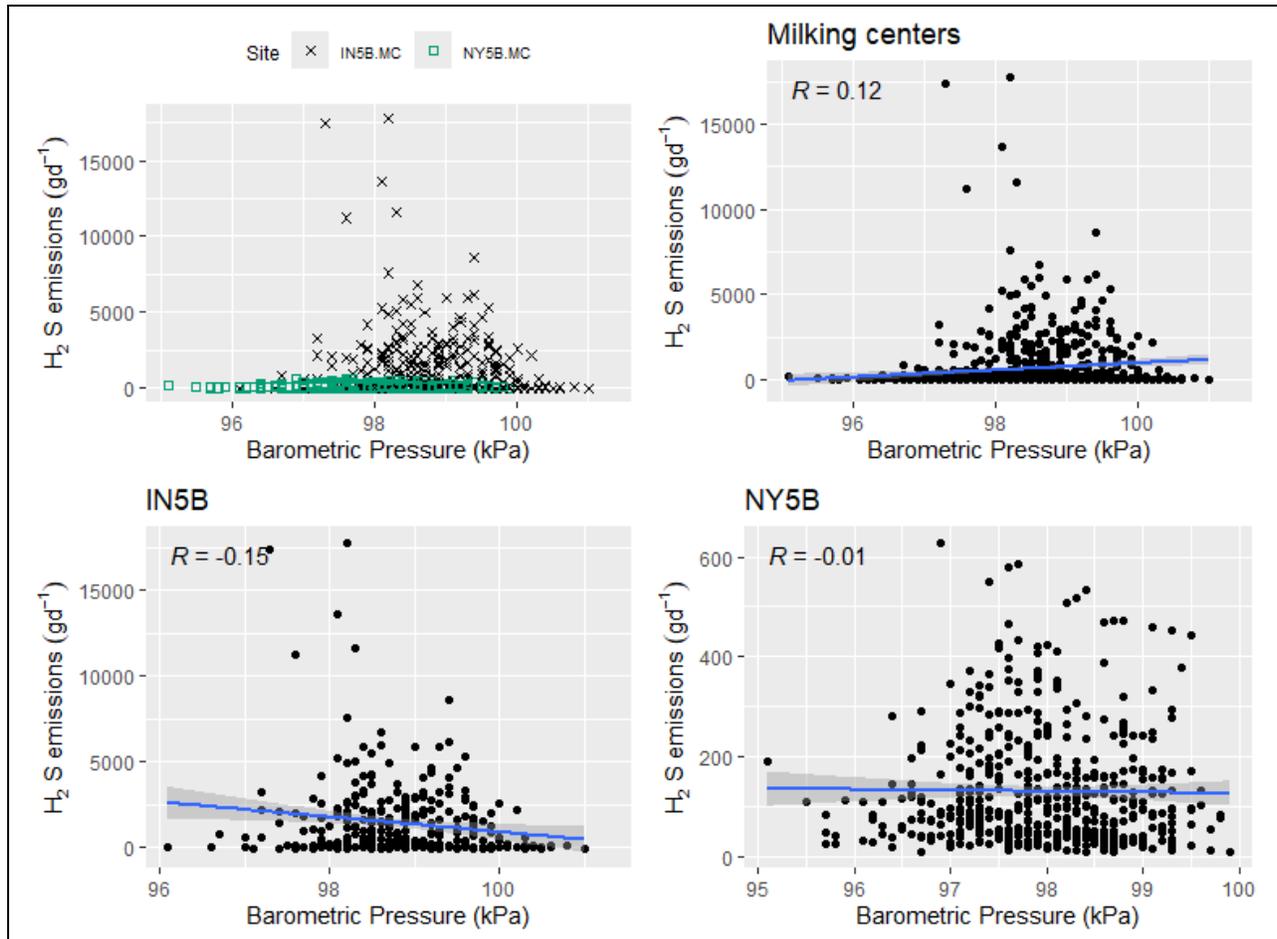


Figure 2.71: Scatter plot of milking centers H₂S emissions (g d⁻¹) versus air pressure.

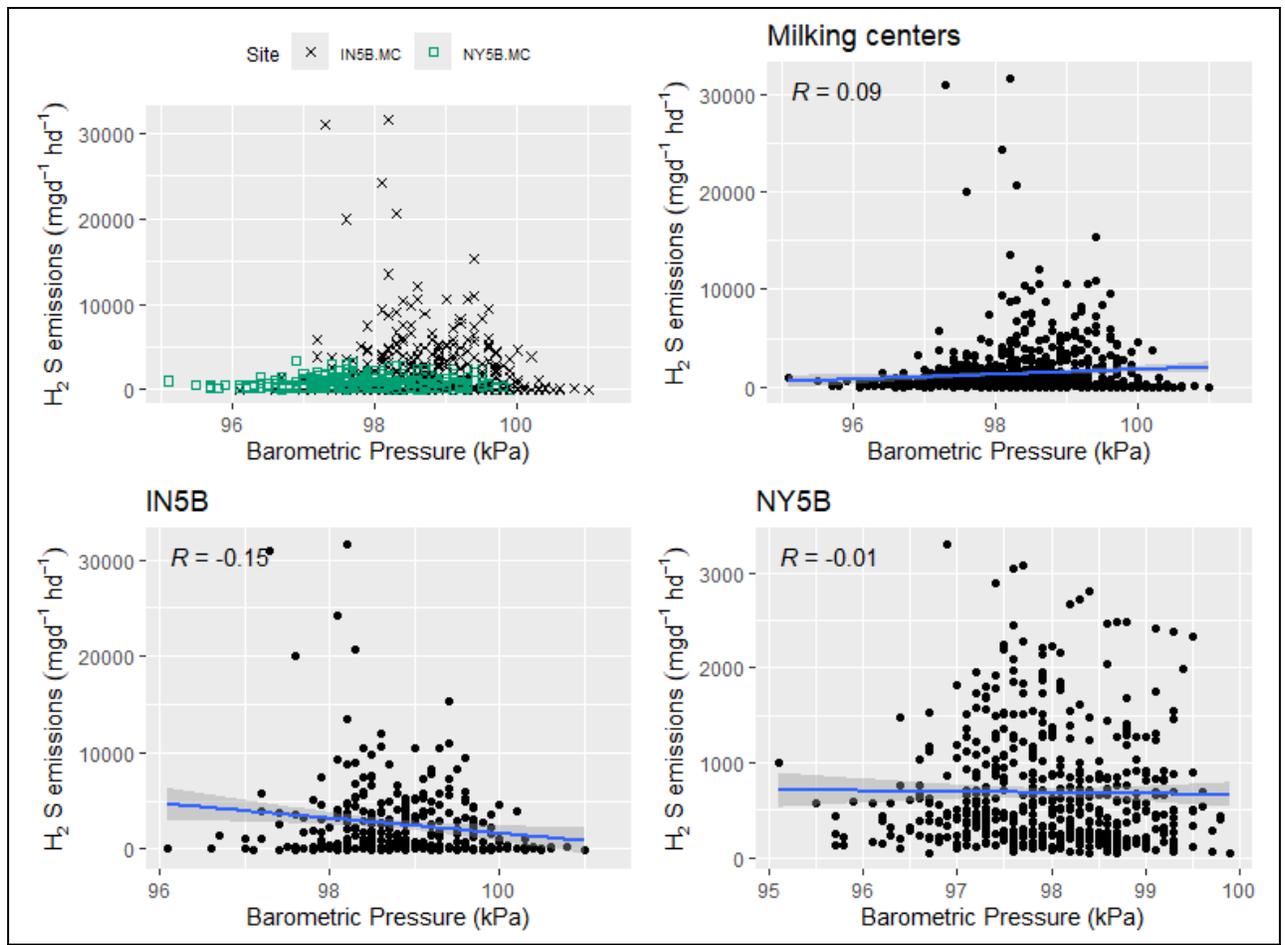


Figure 2.72: Scatter plot of milking centers H₂S emissions (mg d⁻¹hd⁻¹) versus air pressure.

2.2.3 Particulate Matter (PM₁₀)

2.2.3.1 Ambient temperature

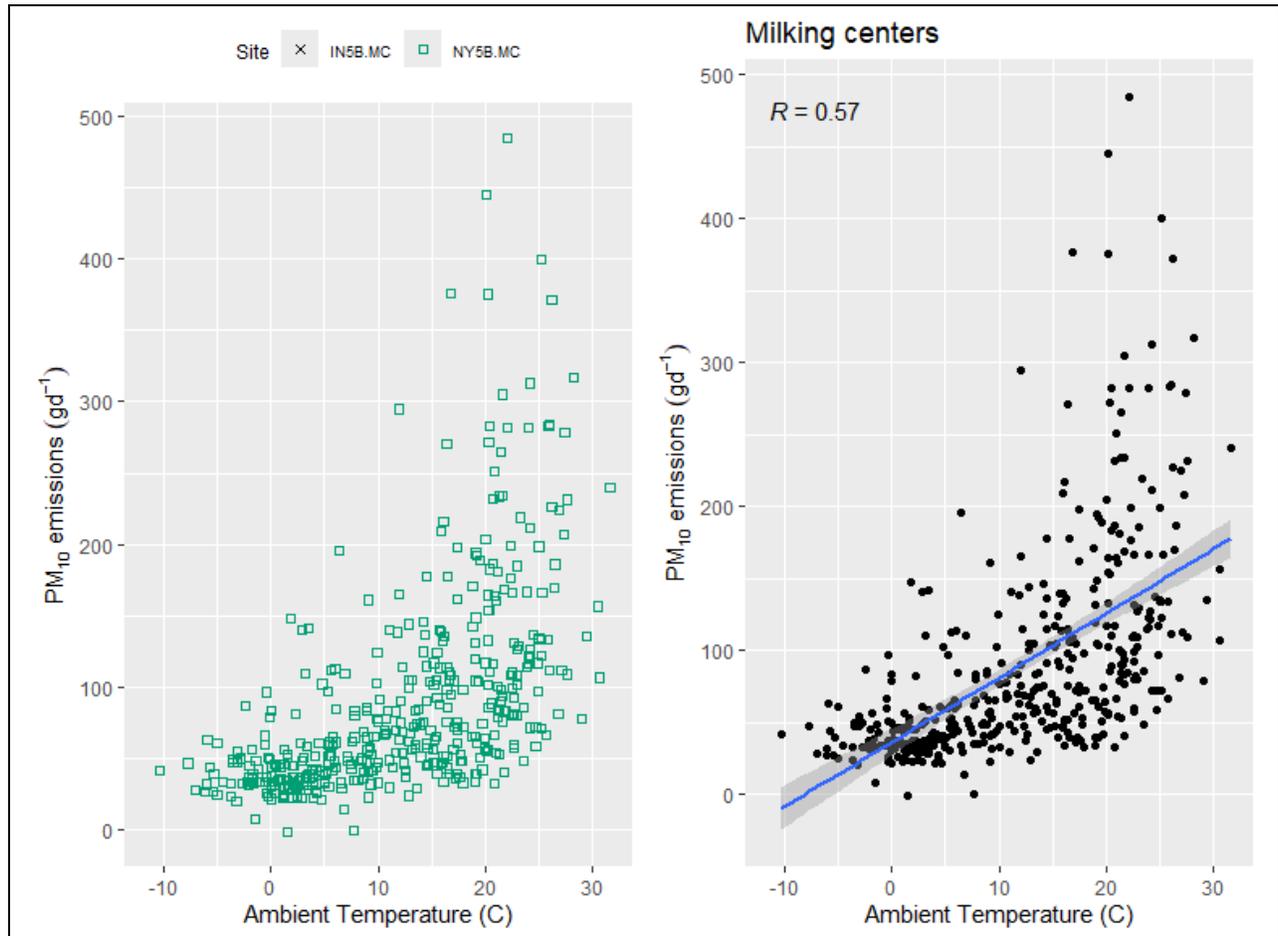


Figure 2.73: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus ambient temperature.

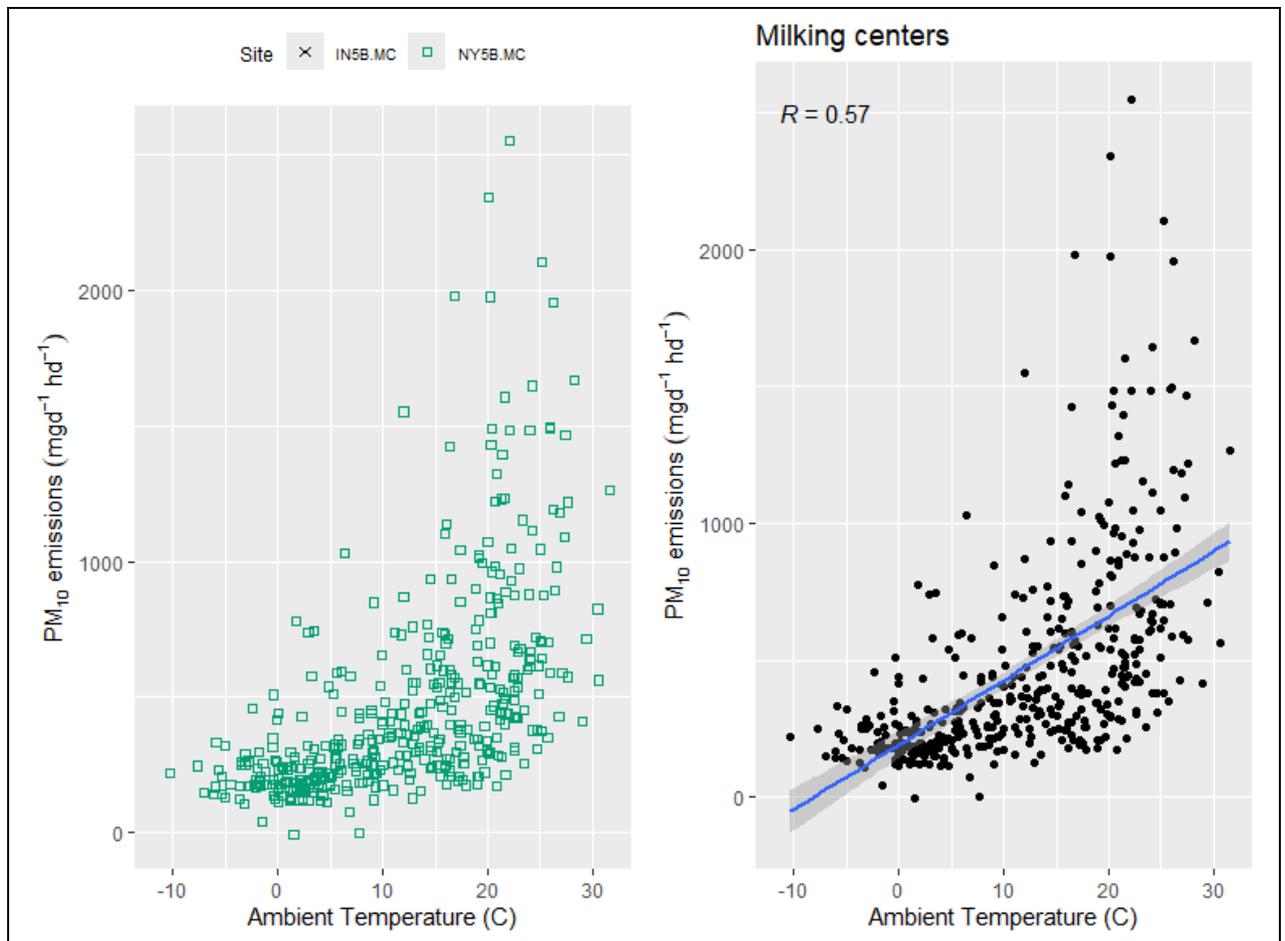


Figure 2.74: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

2.2.3.2 Ambient relative humidity

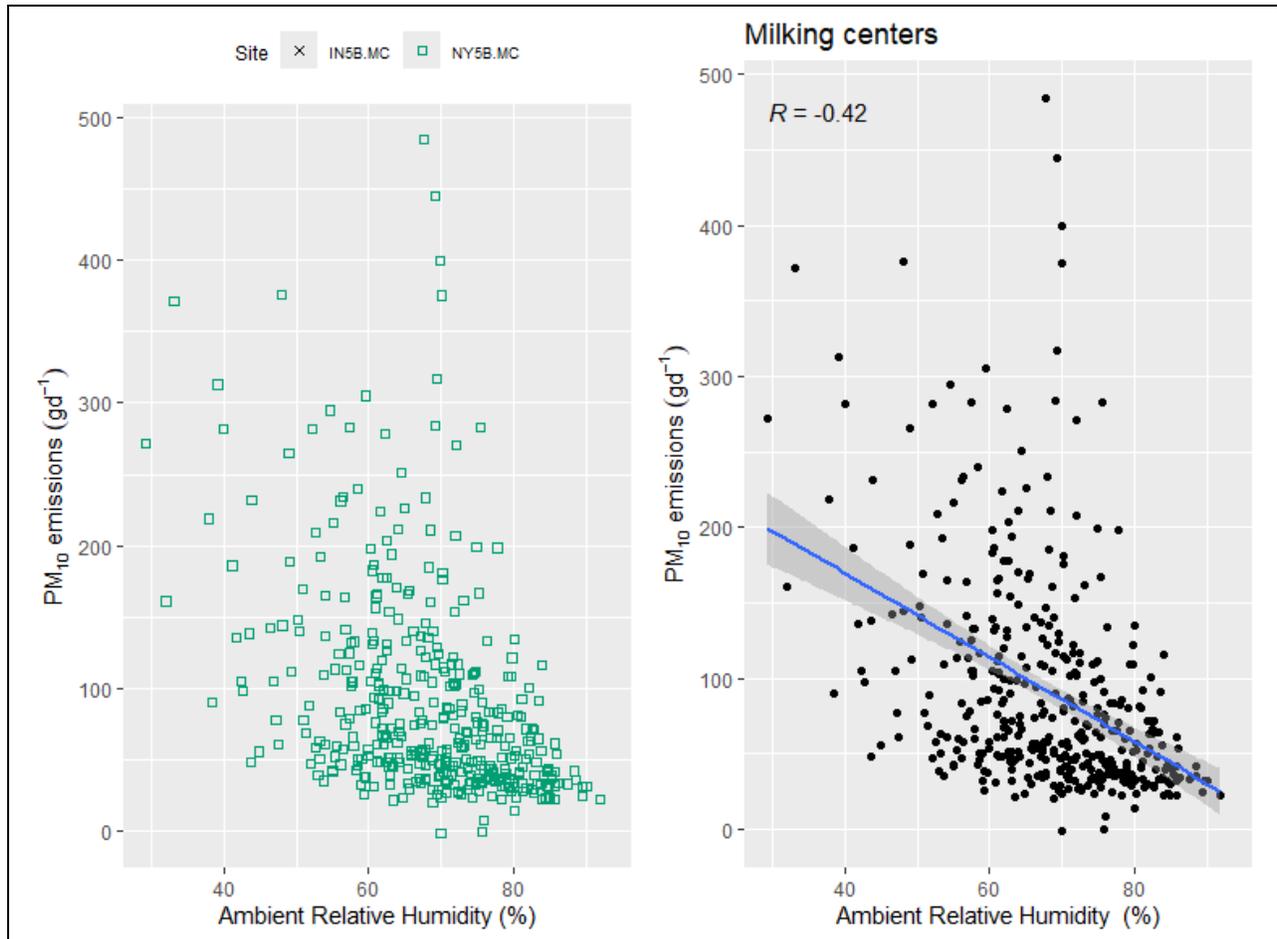


Figure 2.75: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus ambient relative humidity.

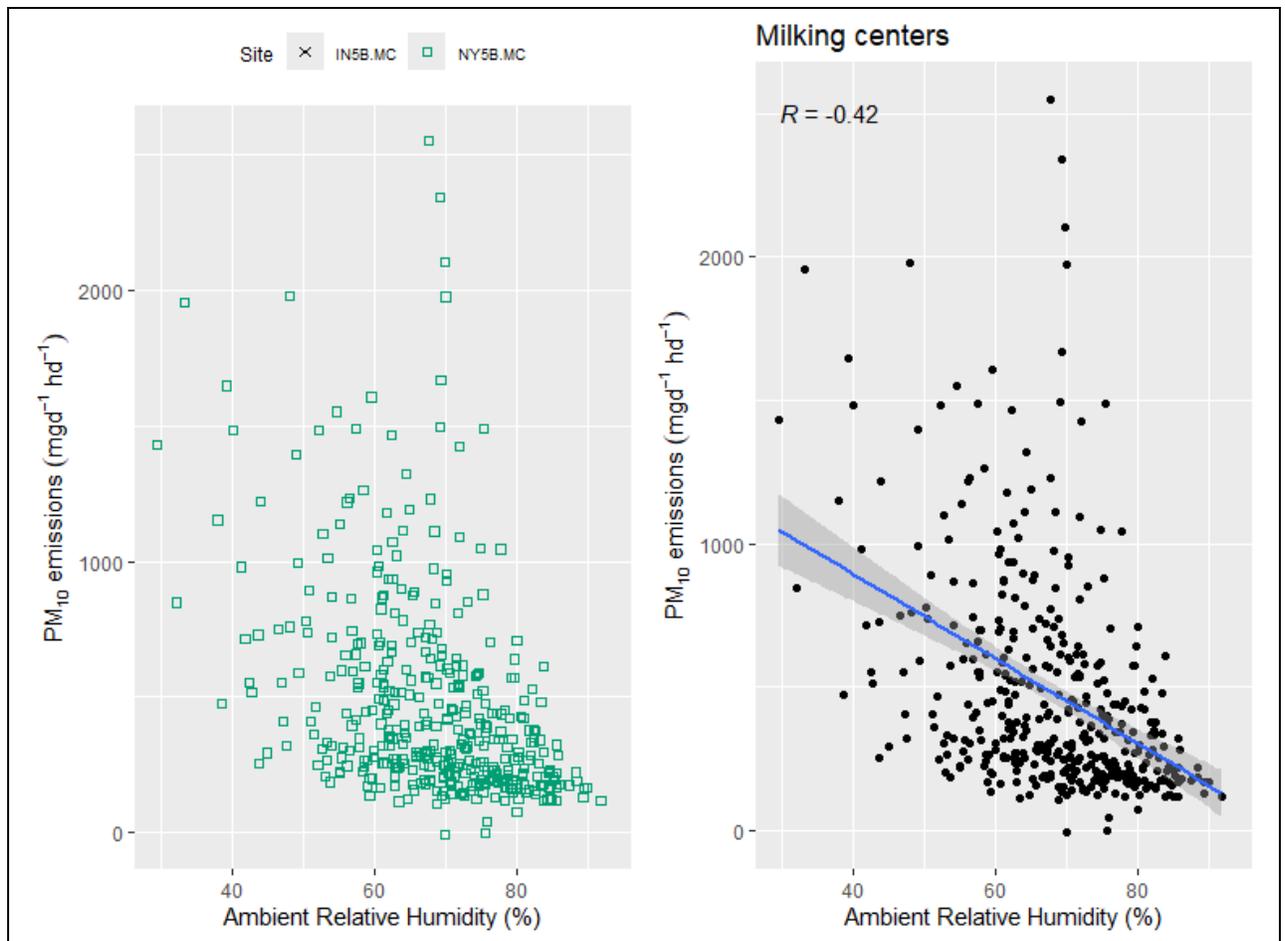


Figure 2.76: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

2.2.3.3 Air pressure

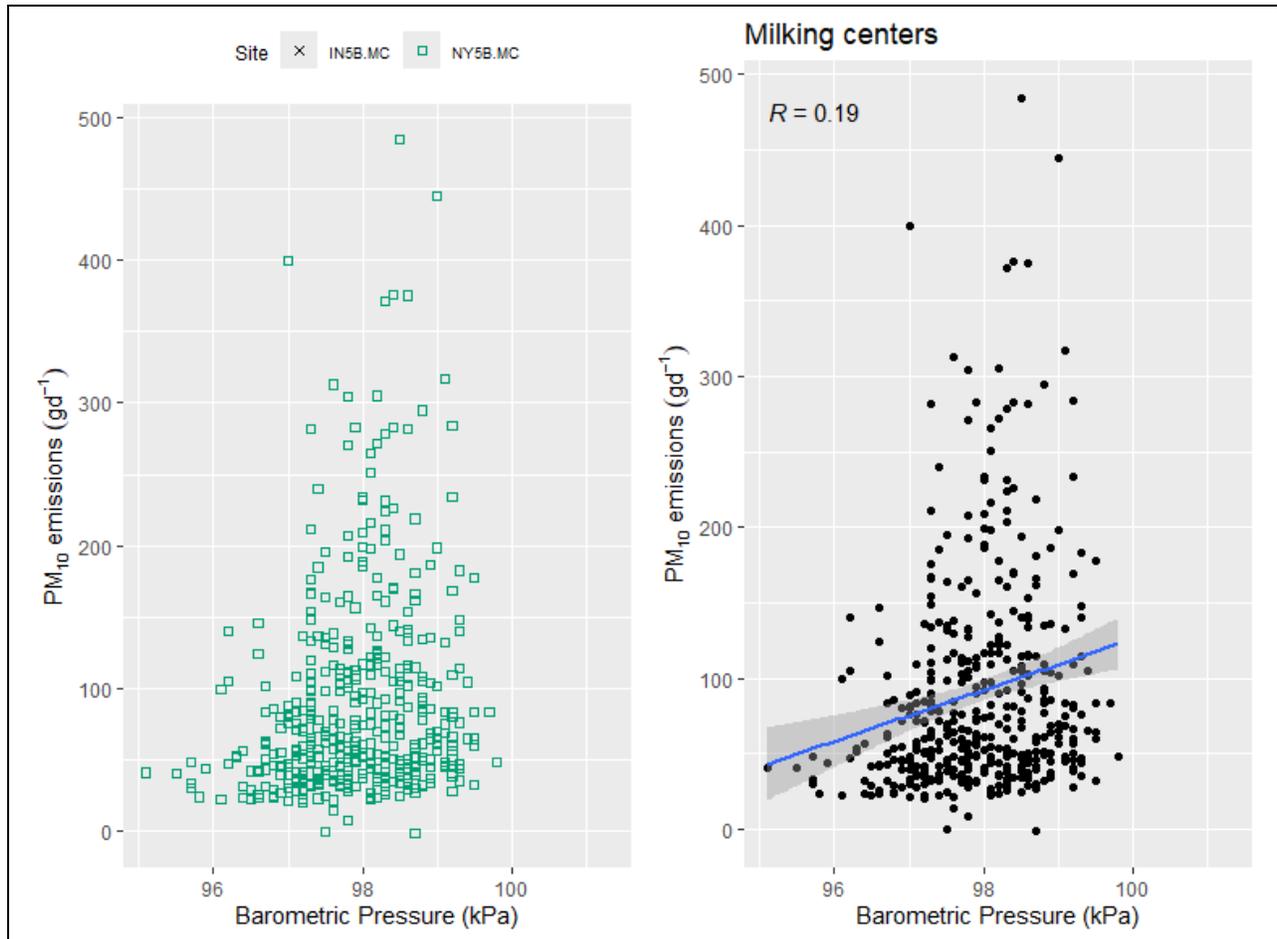


Figure 2.77: Scatter plot of milking centers PM₁₀ emissions (g d⁻¹) versus air pressure.

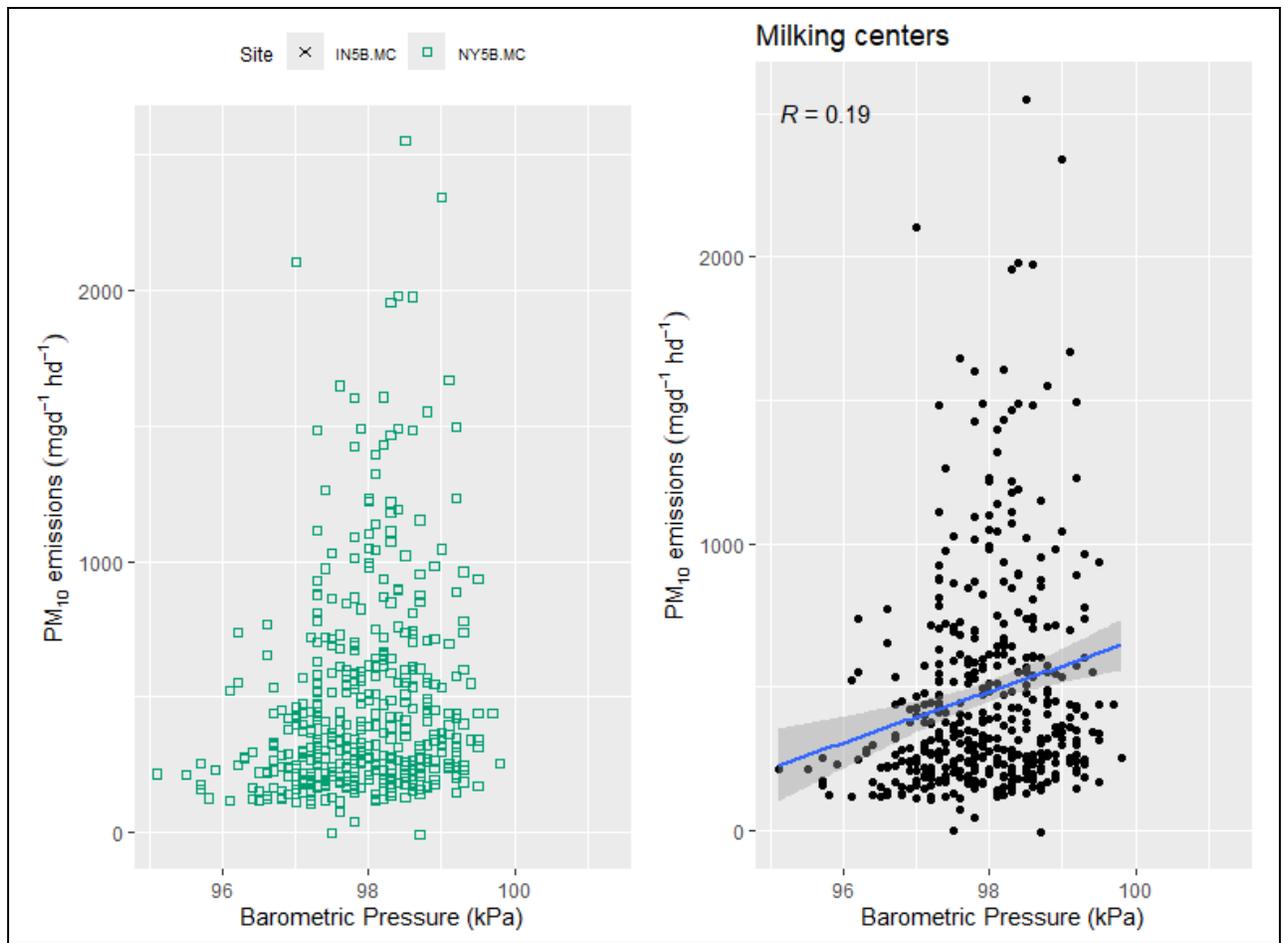


Figure 2.78: Scatter plot of milking centers PM₁₀ emissions (mg d⁻¹hd⁻¹) versus air pressure.

2.2.4 Particulate Matter (PM_{2.5})

2.2.4.1 Ambient temperature

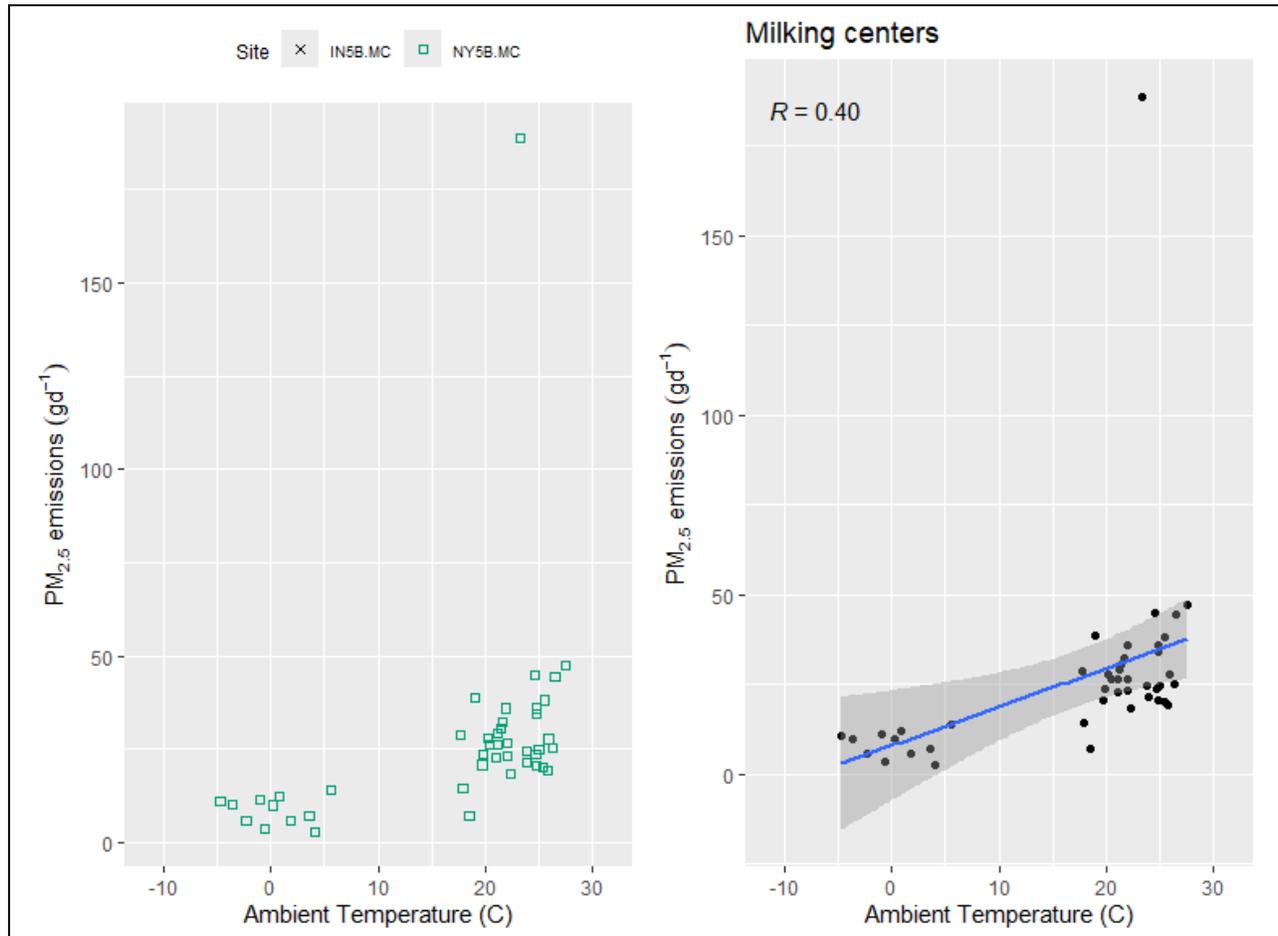


Figure 2.79: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus ambient temperature.

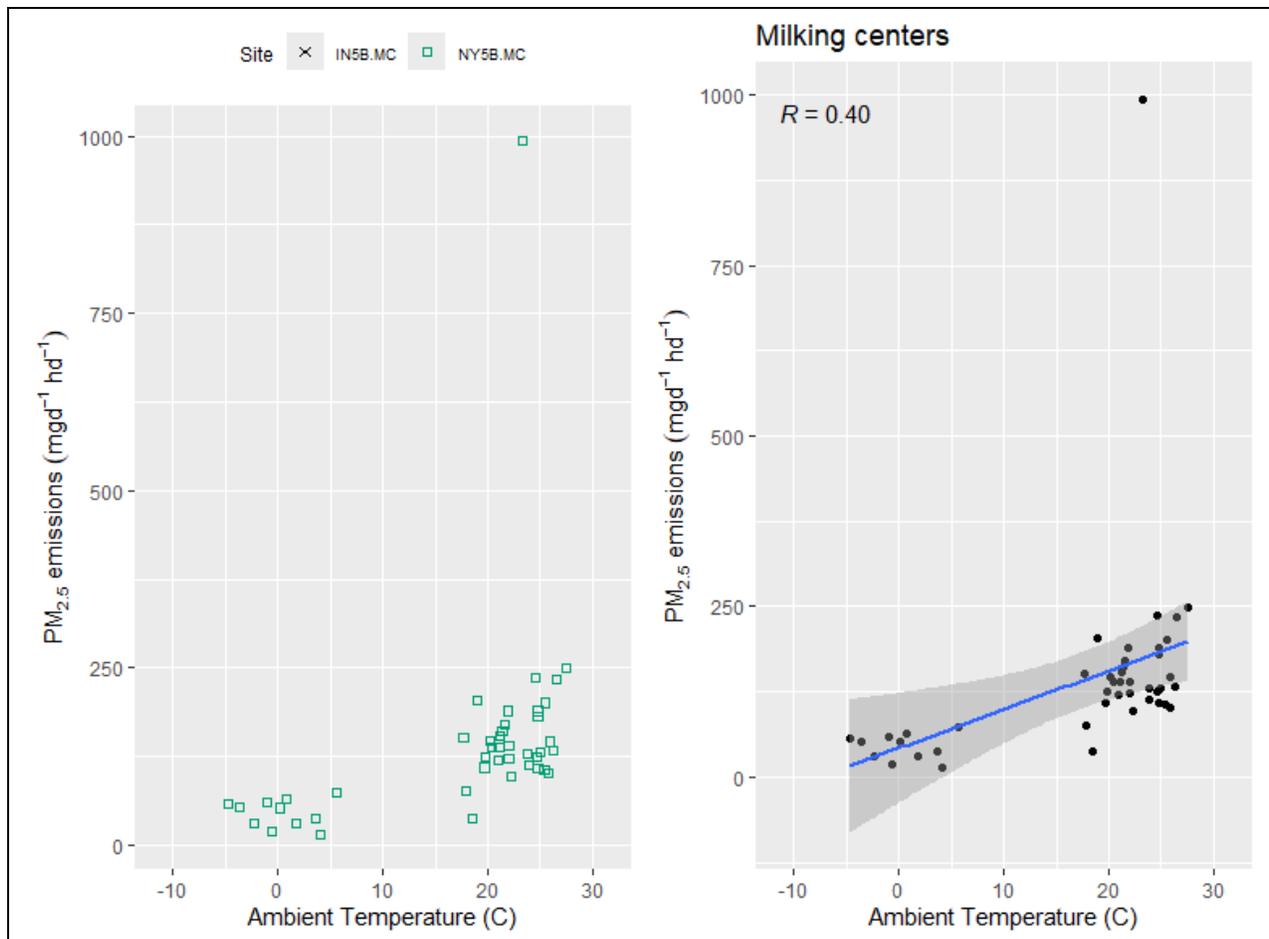


Figure 2.80: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

2.2.4.2 Ambient relative humidity

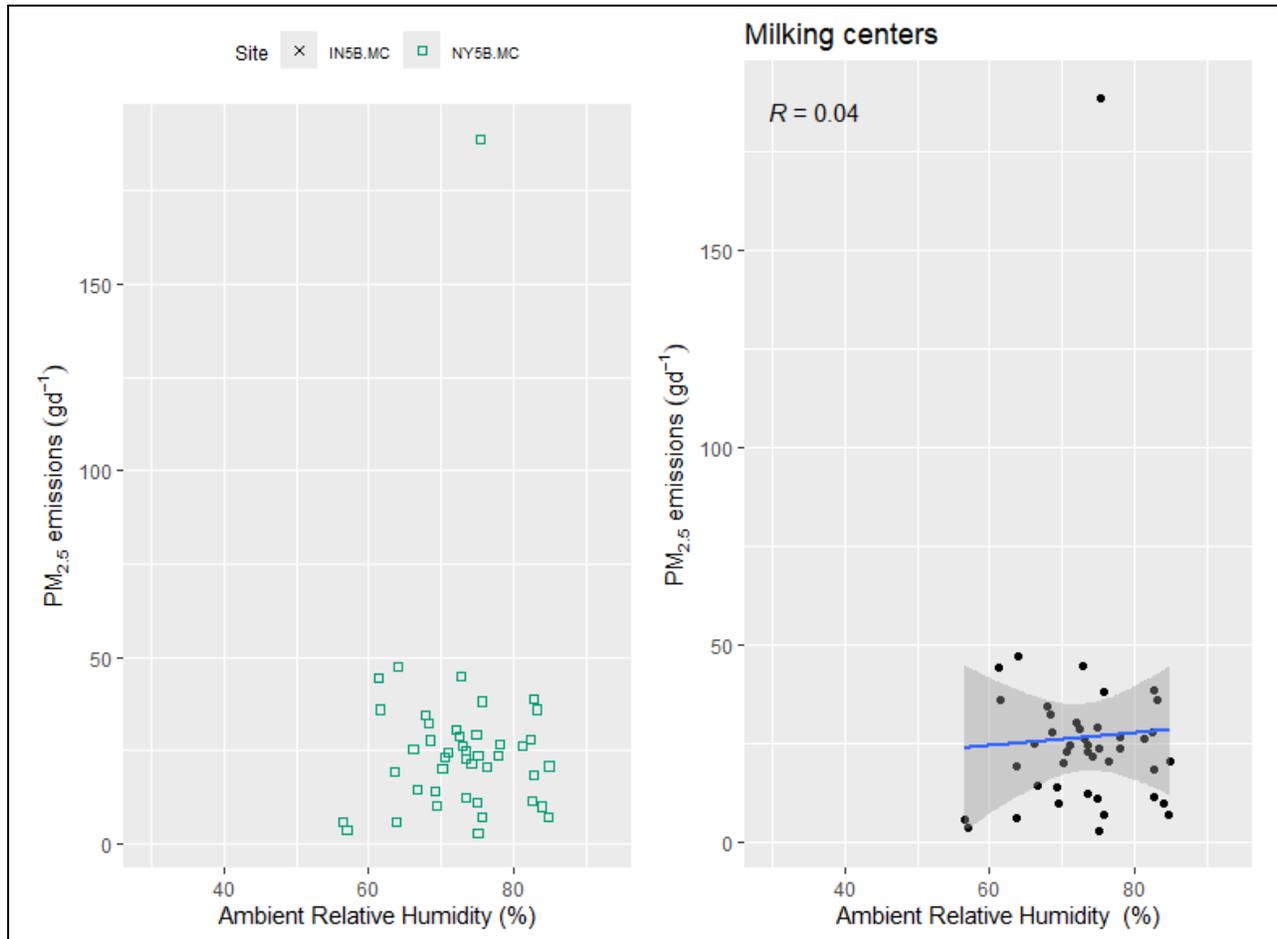


Figure 2.81: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus ambient relative humidity.

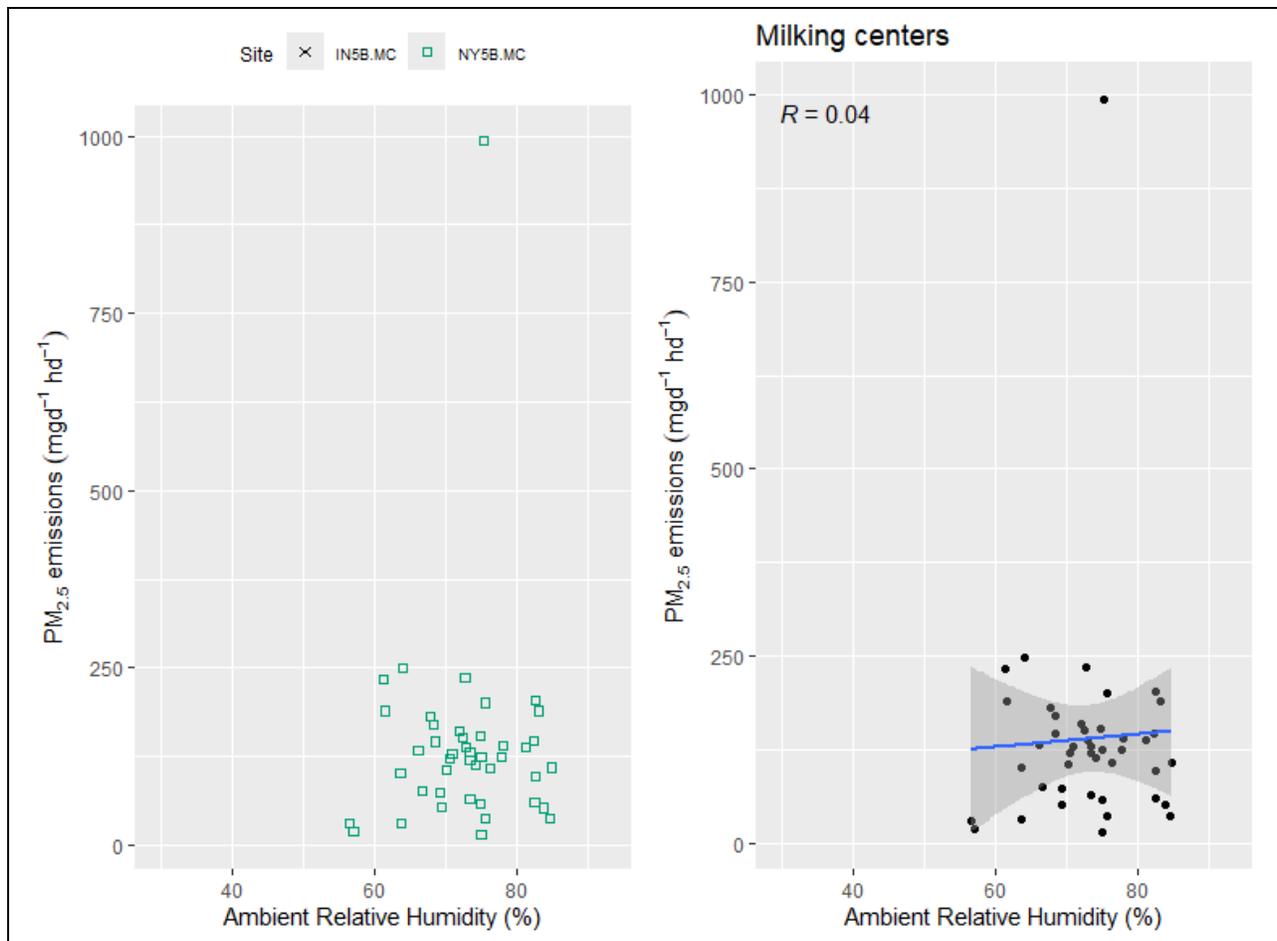


Figure 2.82: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

2.2.4.3 Air pressure

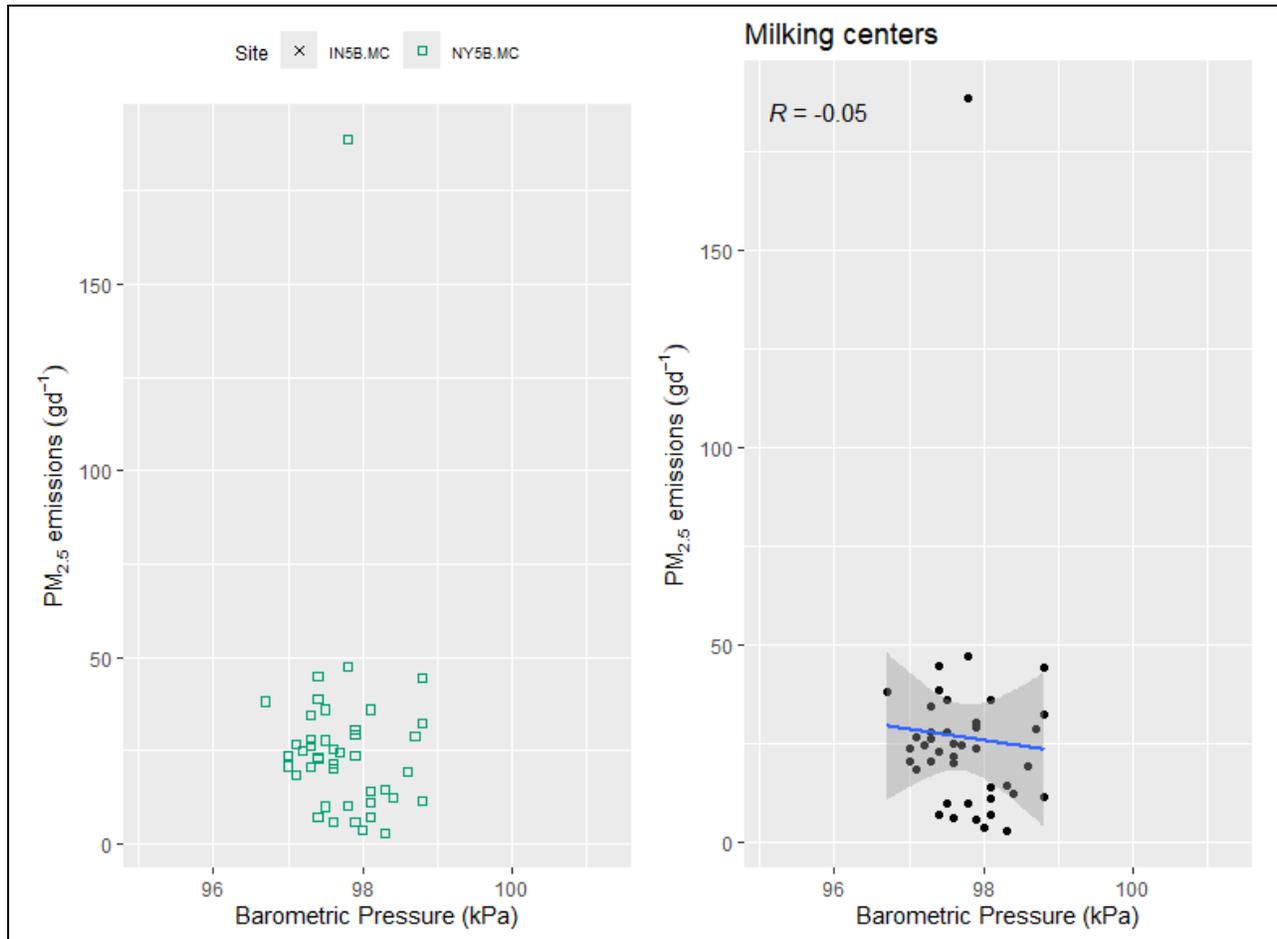


Figure 2.83: Scatter plot of milking centers PM_{2.5} emissions (g d⁻¹) versus air pressure.

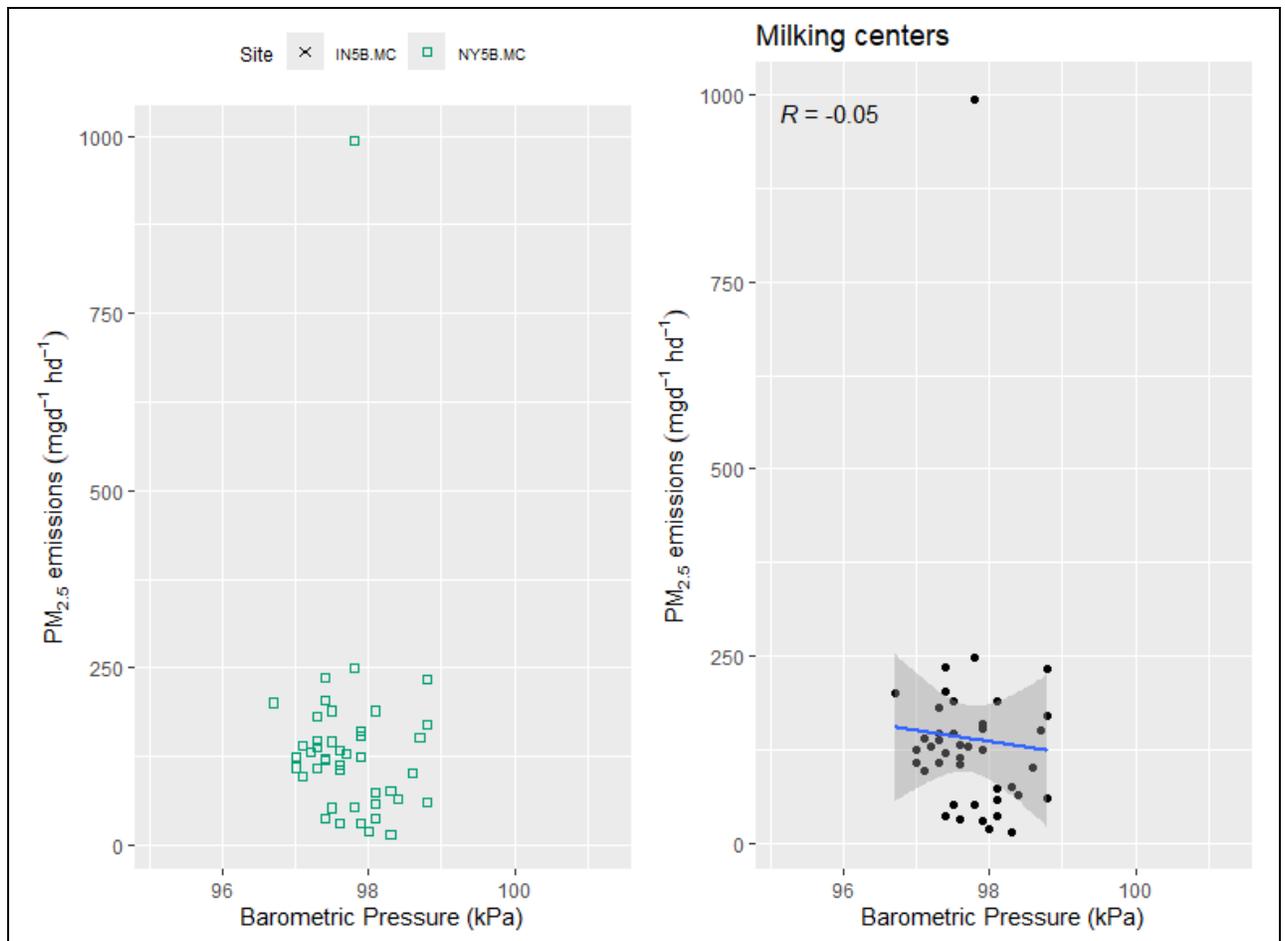


Figure 2.84: Scatter plot of milking centers PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus air pressure.

2.2.5 Total Suspended Particulates (TSP)

2.2.5.1 Ambient temperature

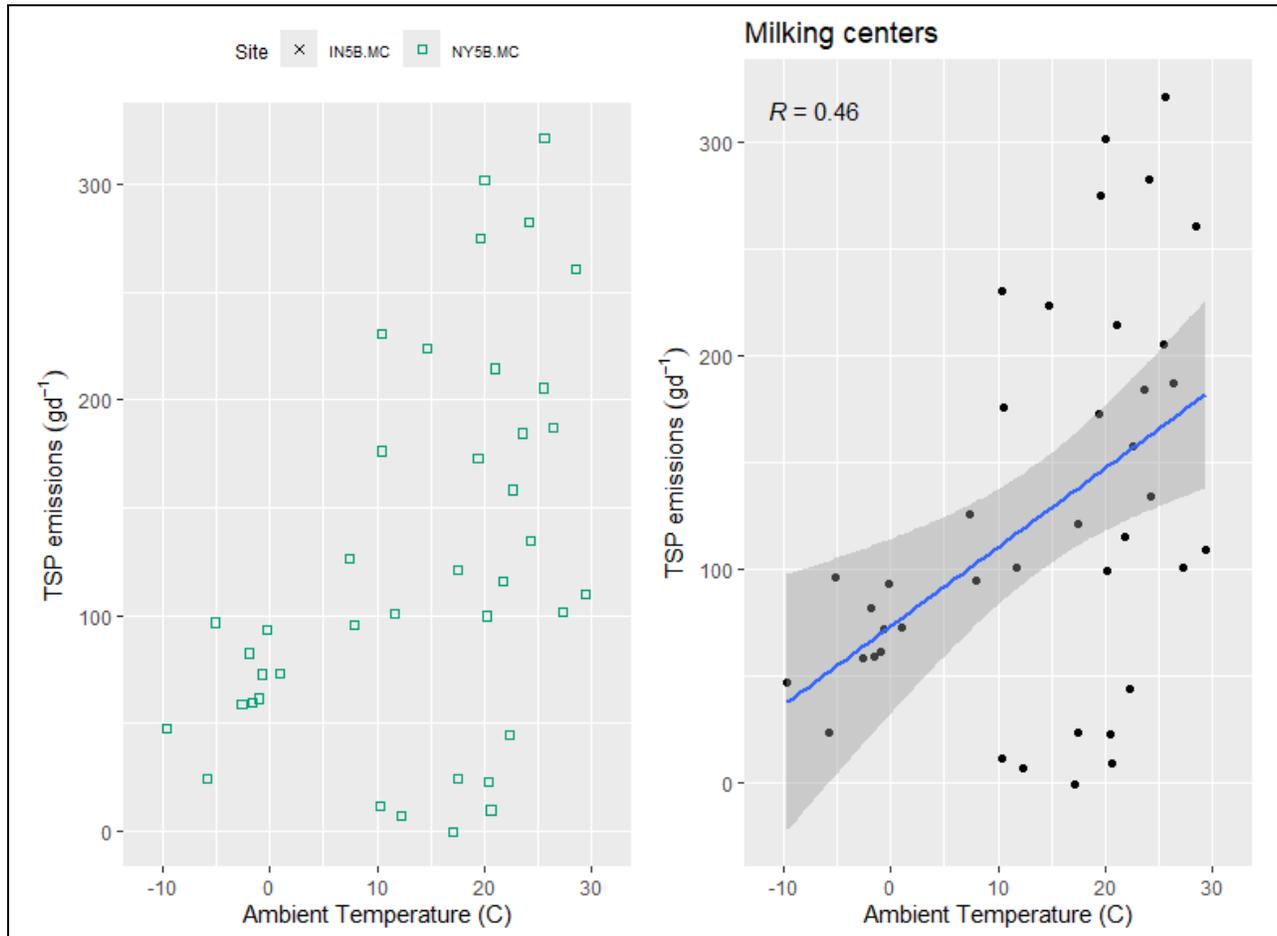


Figure 2.85: Scatter plot of milking centers TSP emissions (g d⁻¹) versus ambient temperature.

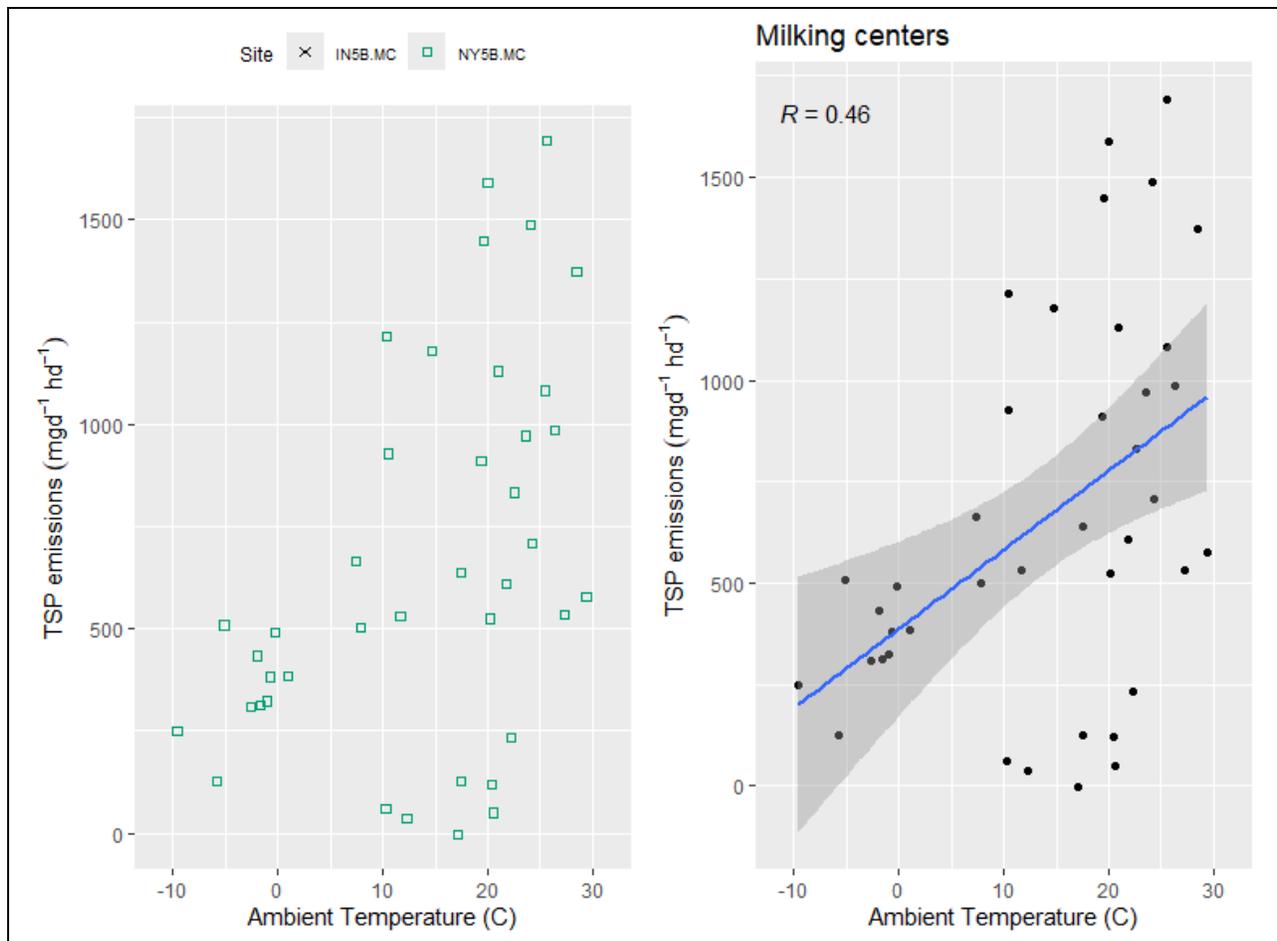


Figure 2.86: Scatter plot of milking centers TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus ambient temperature.

2.2.5.2 Ambient relative humidity

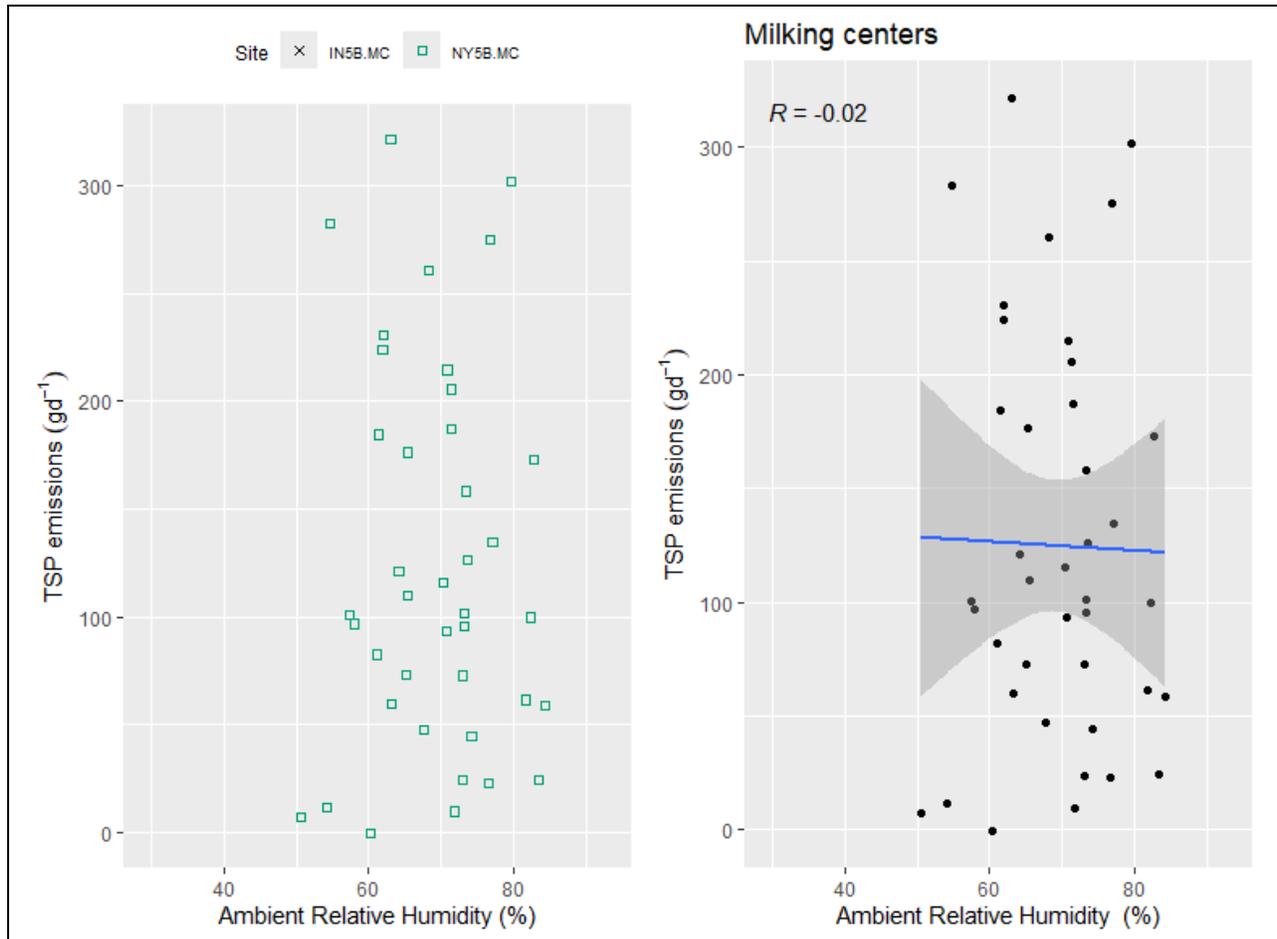


Figure 2.87: Scatter plot of milking centers TSP emissions (g d^{-1}) versus ambient relative humidity.

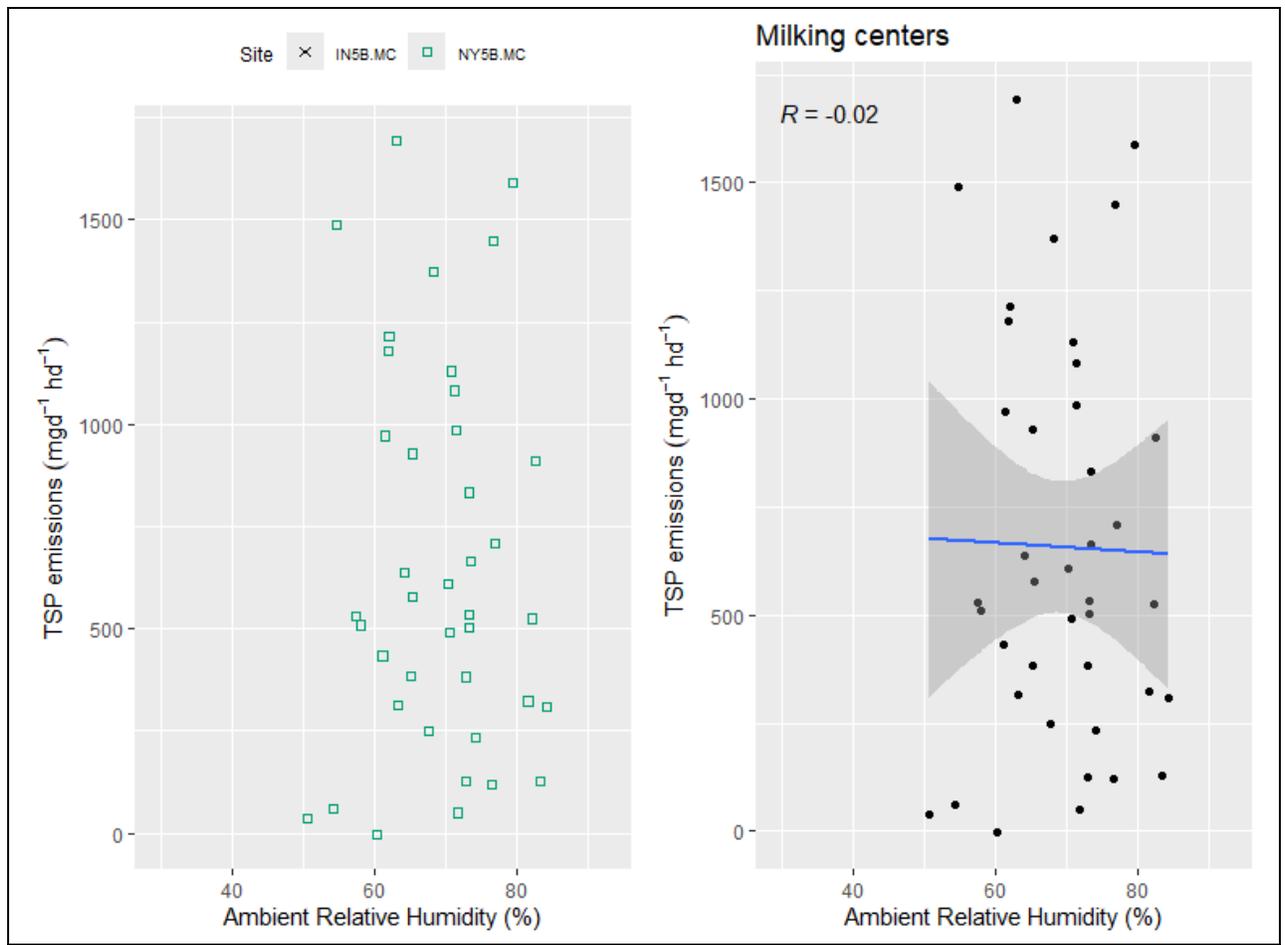


Figure 2.88: Scatter plot of milking centers TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus ambient relative humidity.

2.2.5.3 Air pressure

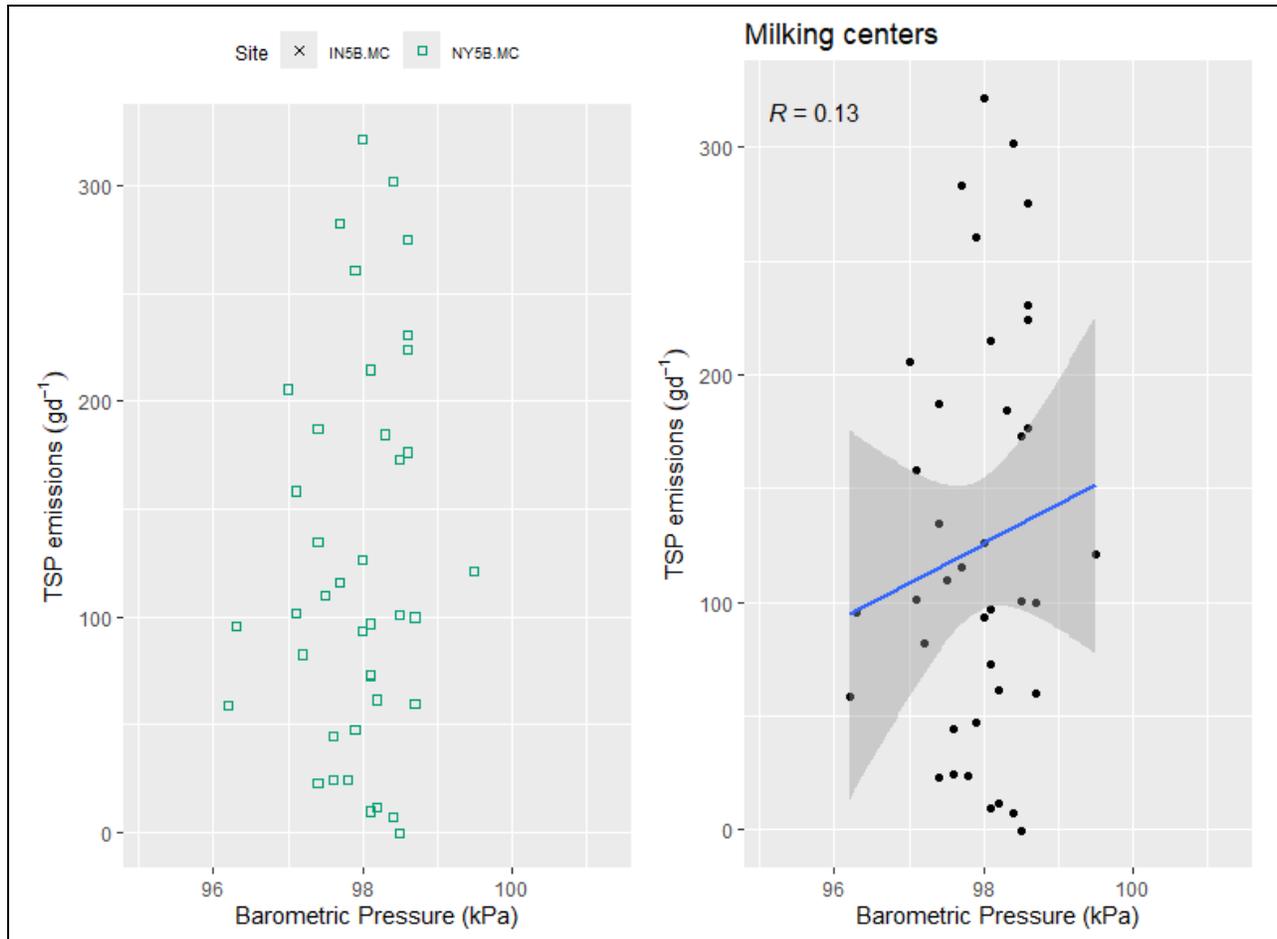


Figure 2.89: Scatter plot of milking centers TSP emissions (g d⁻¹) versus air pressure.

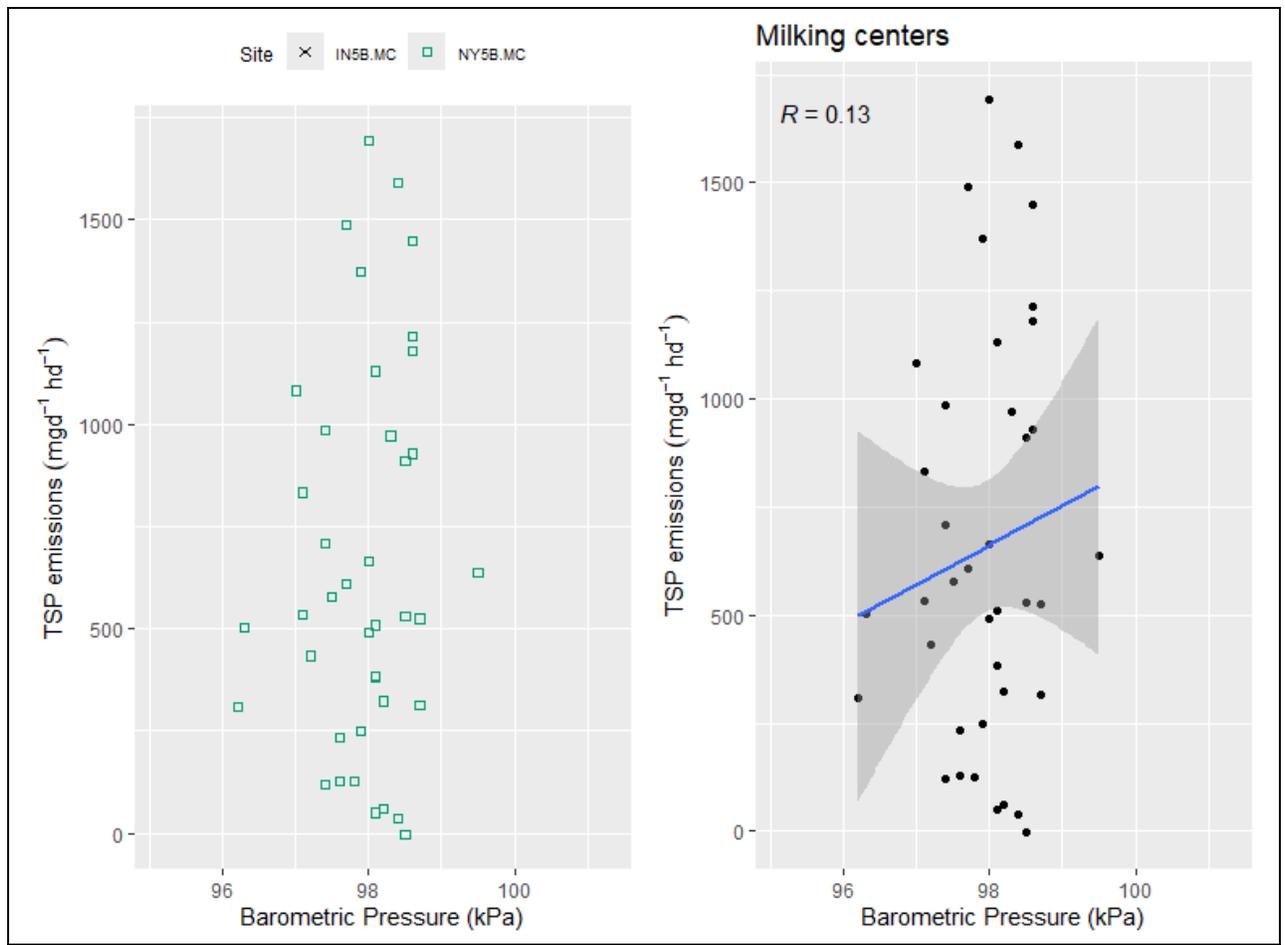


Figure 2.90: Scatter plot of milking centers TSP emissions (mg d⁻¹hd⁻¹) versus air pressure.

3 Naturally Ventilated

3.1 Environmental

Table 3.1: Summary of naturally ventilated dairy barns R² values for environmental parameters (kg d⁻¹)

Emissions	Parameter	R	R2	Strength
NH ₃ (kgd ⁻¹)	Inventory (hd)	0.62	0.39	modest
H ₂ S (gd ⁻¹)	Inventory (hd)	0.33	0.11	slight or weak
PM ₁₀ (gd ⁻¹)	Inventory (hd)	0.24	0.06	slight or weak
PM _{2.5} (gd ⁻¹)	Inventory (hd)	-0.06	0	slight or weak
TSP (gd ⁻¹)	Inventory (hd)	0.39	0.15	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Inventory (hd)	0.37	0.14	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	0.12	0.02	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	0.13	0.02	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	-0.32	0.1	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Inventory (hd)	0.28	0.08	slight or weak
NH ₃ (kgd ⁻¹)	Average weight (kg)	NA	NA	NA
H ₂ S (gd ⁻¹)	Average weight (kg)	NA	NA	NA
PM ₁₀ (gd ⁻¹)	Average weight (kg)	NA	NA	NA
PM _{2.5} (gd ⁻¹)	Average weight (kg)	NA	NA	NA
TSP (gd ⁻¹)	Average weight (kg)	NA	NA	NA
NH ₃ (gd ⁻¹ hd ⁻¹)	Average weight (kg)	NA	NA	NA
H ₂ S (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	NA	NA	NA
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	NA	NA	NA
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	NA	NA	NA
TSP (mgd ⁻¹ hd ⁻¹)	Average weight (kg)	NA	NA	NA
NH ₃ (kgd ⁻¹)	Live animal weight (kg)	0.62	0.39	modest
H ₂ S (gd ⁻¹)	Live animal weight (kg)	0.33	0.11	slight or weak
PM ₁₀ (gd ⁻¹)	Live animal weight (kg)	0.24	0.06	slight or weak
PM _{2.5} (gd ⁻¹)	Live animal weight (kg)	-0.06	0	slight or weak
TSP (gd ⁻¹)	Live animal weight (kg)	0.39	0.15	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0.37	0.14	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0.12	0.02	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0.13	0.02	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	-0.32	0.1	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Live animal weight (kg)	0.28	0.08	slight or weak
NH ₃ (kgd ⁻¹)	Exhaust Temperature (°C)	-0.13	0.02	slight or weak
H ₂ S (gd ⁻¹)	Exhaust Temperature (°C)	-0.14	0.02	slight or weak
PM ₁₀ (gd ⁻¹)	Exhaust Temperature (°C)	0.07	0.01	slight or weak
PM _{2.5} (gd ⁻¹)	Exhaust Temperature (°C)	0.08	0.01	slight or weak
TSP (gd ⁻¹)	Exhaust Temperature (°C)	0.2	0.04	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	-0.12	0.01	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	-0.13	0.02	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.07	0.01	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.07	0	slight or weak

TSP (mgd ⁻¹ hd ⁻¹)	Exhaust Temperature (°C)	0.26	0.07	slight or weak
NH ₃ (kgd ⁻¹)	Exhaust Relative humidity (%)	-0.4	0.16	slight or weak
H ₂ S (gd ⁻¹)	Exhaust Relative humidity (%)	-0.12	0.02	slight or weak
PM ₁₀ (gd ⁻¹)	Exhaust Relative humidity (%)	-0.24	0.06	slight or weak
PM _{2.5} (gd ⁻¹)	Exhaust Relative humidity (%)	-0.12	0.01	slight or weak
TSP (gd ⁻¹)	Exhaust Relative humidity (%)	-0.33	0.11	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.4	0.16	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.08	0.01	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.22	0.05	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.11	0.01	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Exhaust Relative humidity (%)	-0.4	0.16	slight or weak
NH ₃ (kgd ⁻¹)	Airflow (dsm ³ s ⁻¹)	-0.02	0	slight or weak
H ₂ S (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.06	0	slight or weak
PM ₁₀ (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.18	0.03	slight or weak
PM _{2.5} (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.36	0.13	slight or weak
TSP (gd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.26	0.07	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	-0.06	0	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.13	0.02	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.17	0.03	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.3	0.09	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Airflow (dsm ³ s ⁻¹)	0.31	0.09	slight or weak

3.1.1 Ammonia (NH₃)

3.1.1.1 Inventory

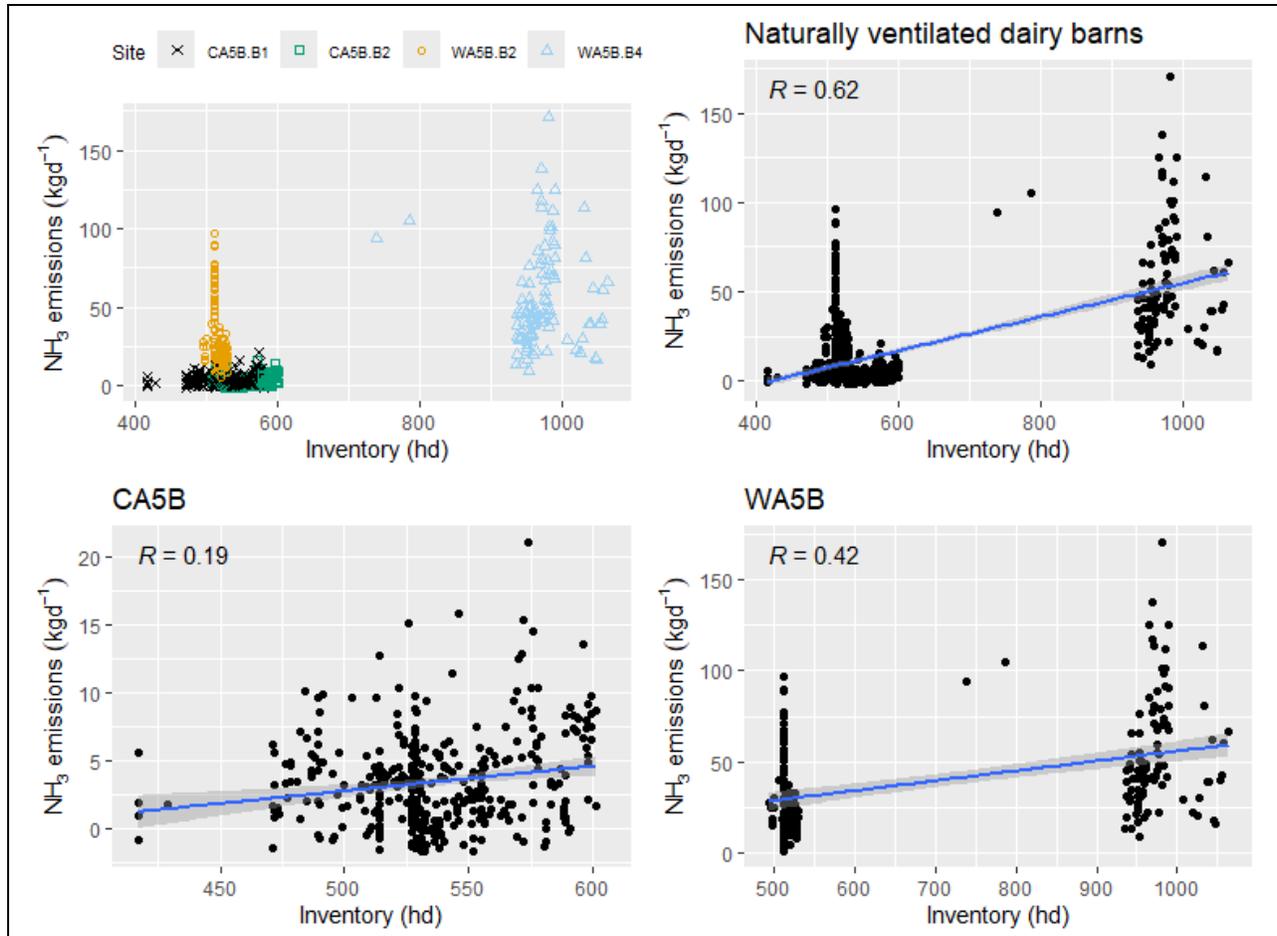


Figure 3.1: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus Inventory.

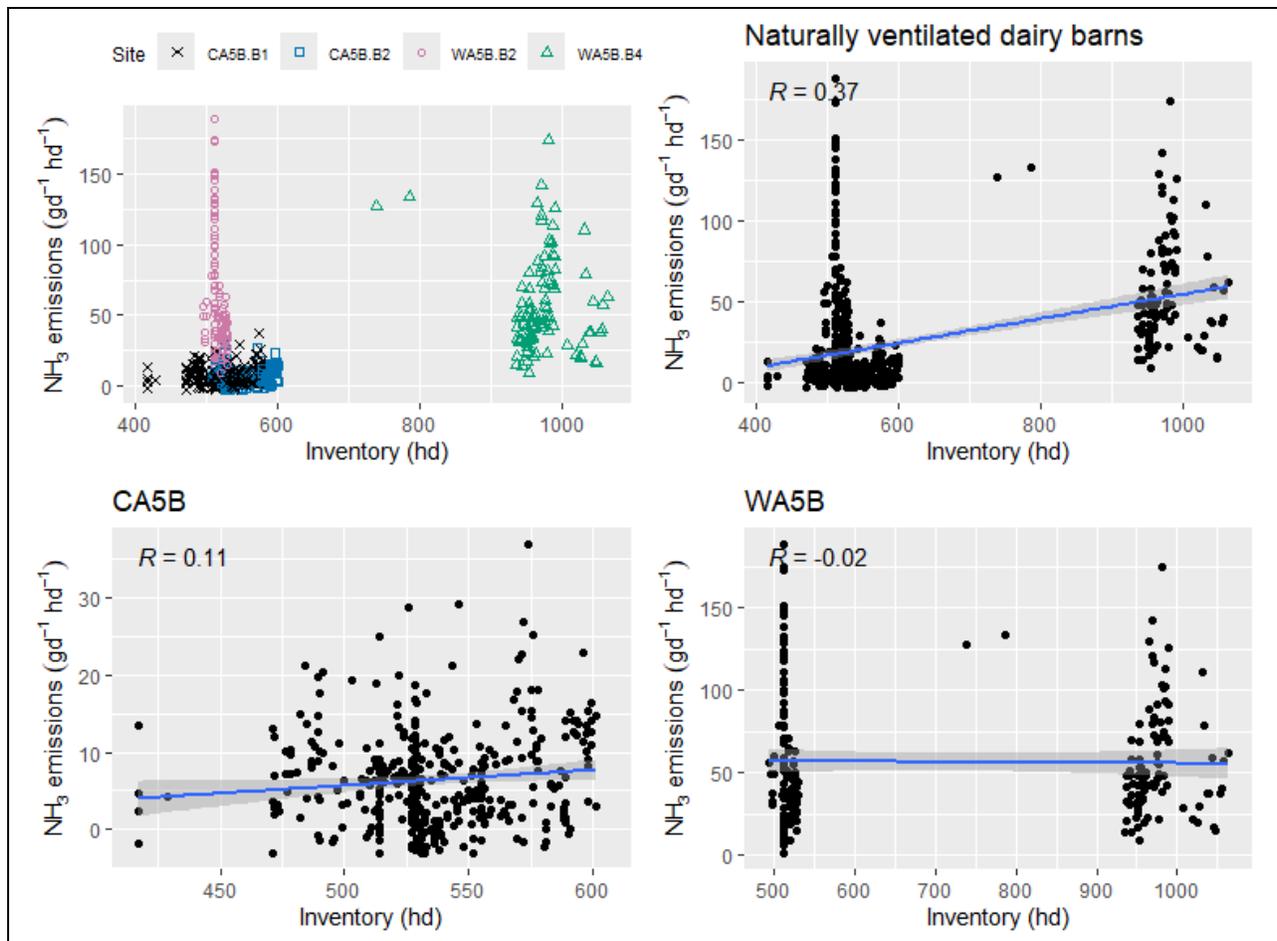


Figure 3.2: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus Inventory.

3.1.1.2 Average animal weight

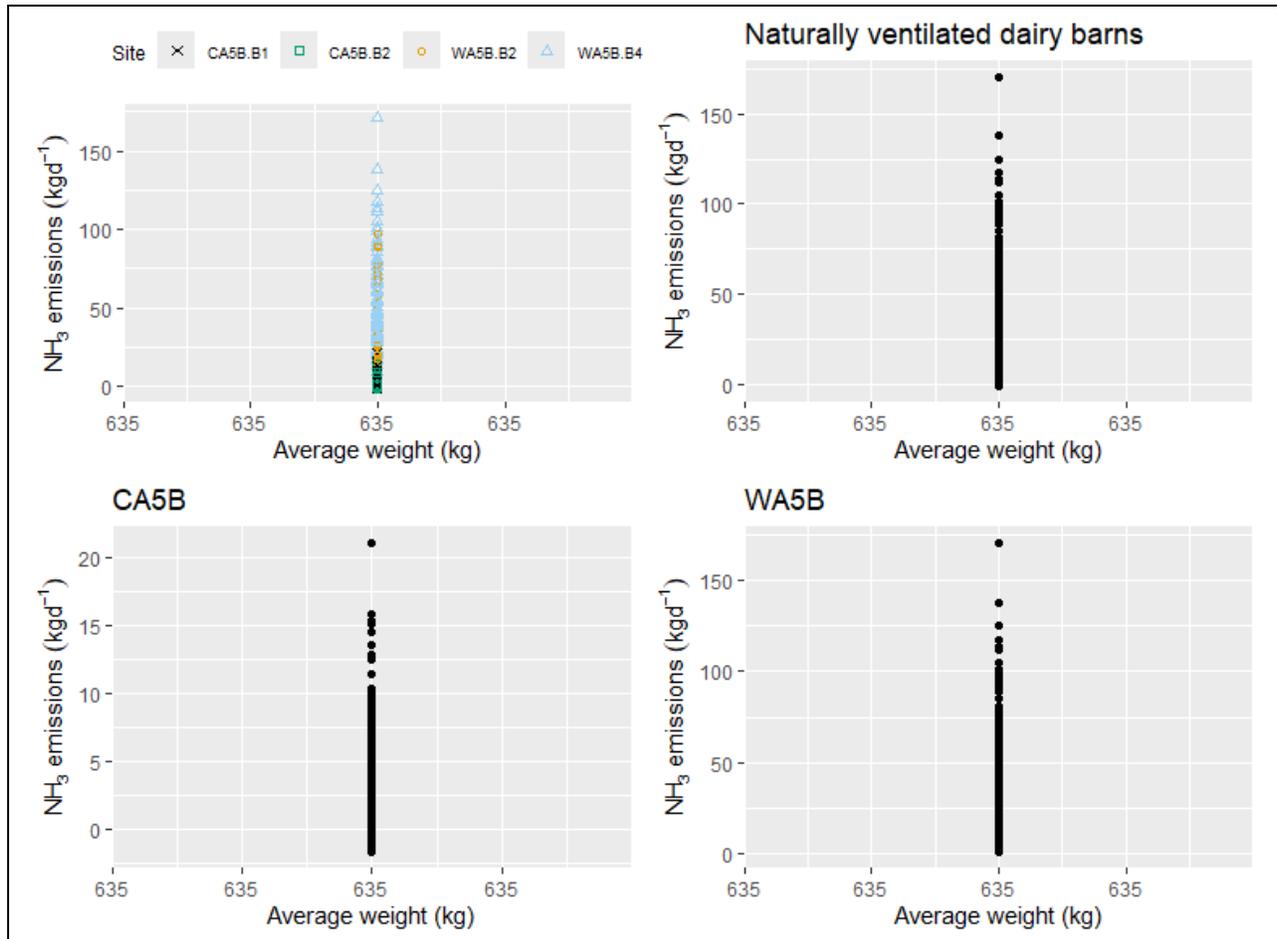


Figure 3.3: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus average animal weight.

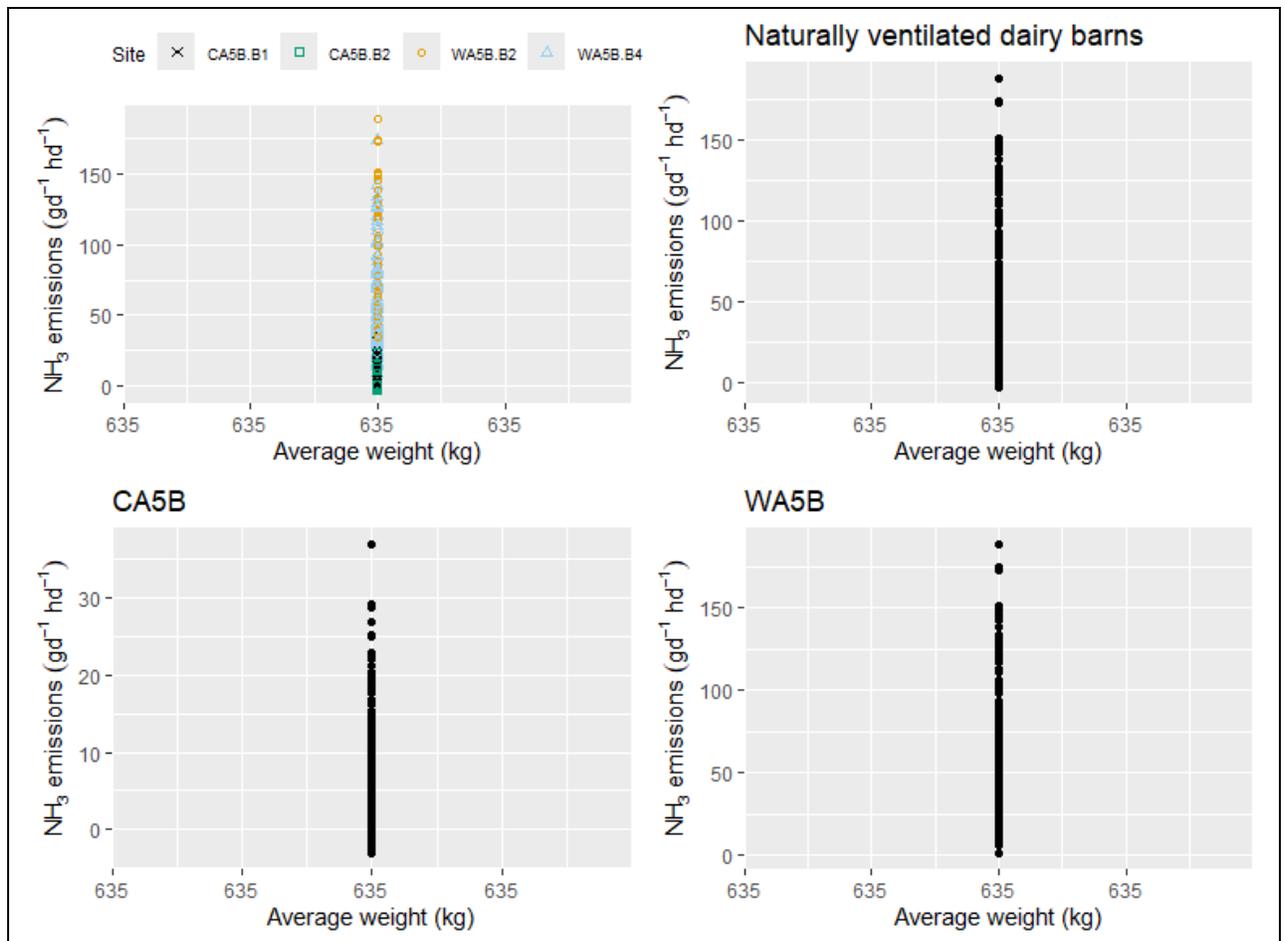


Figure 3.4: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus average animal weight.

3.1.1.3 Live animal weight

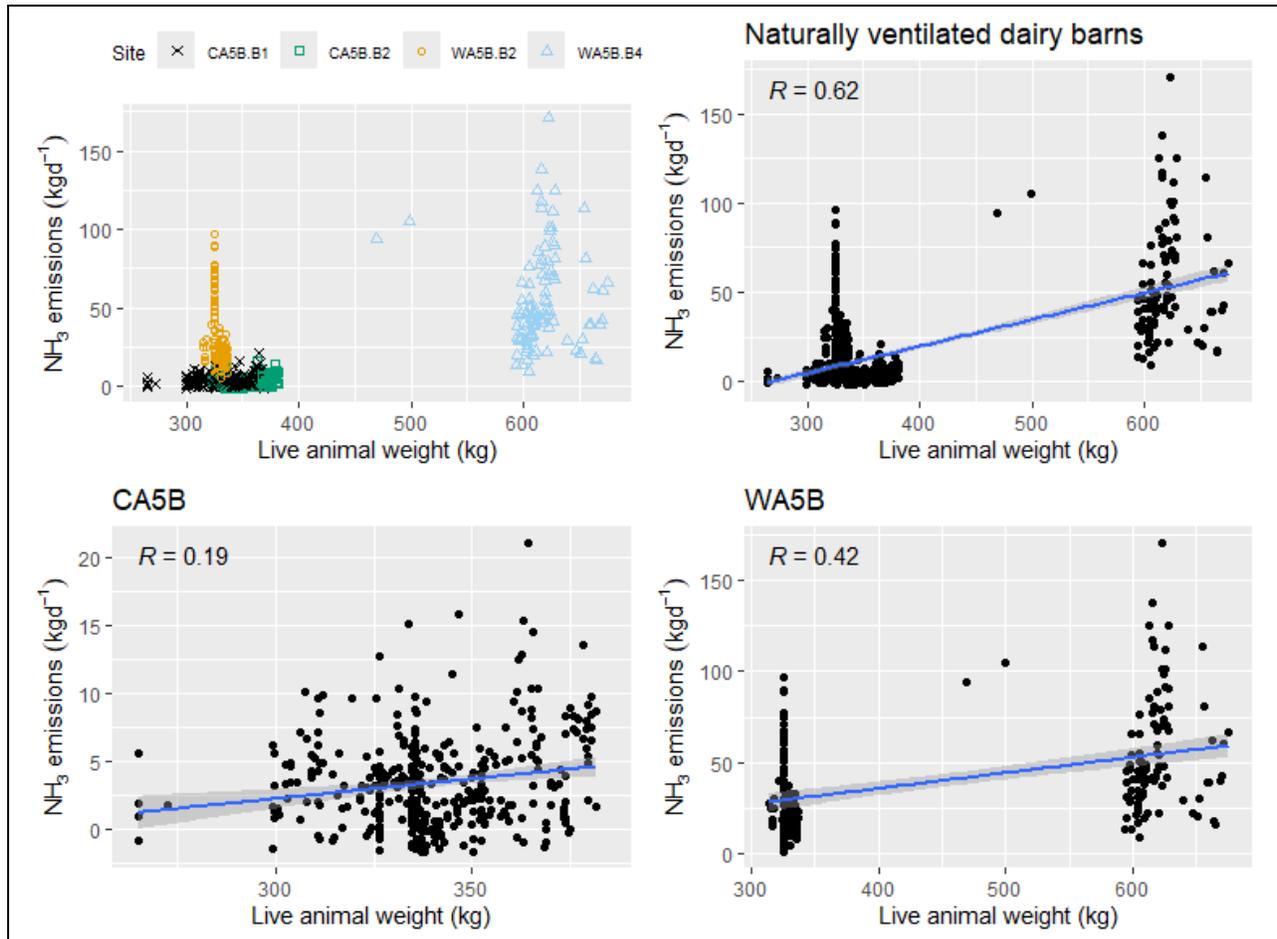


Figure 3.5: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus live animal weight.

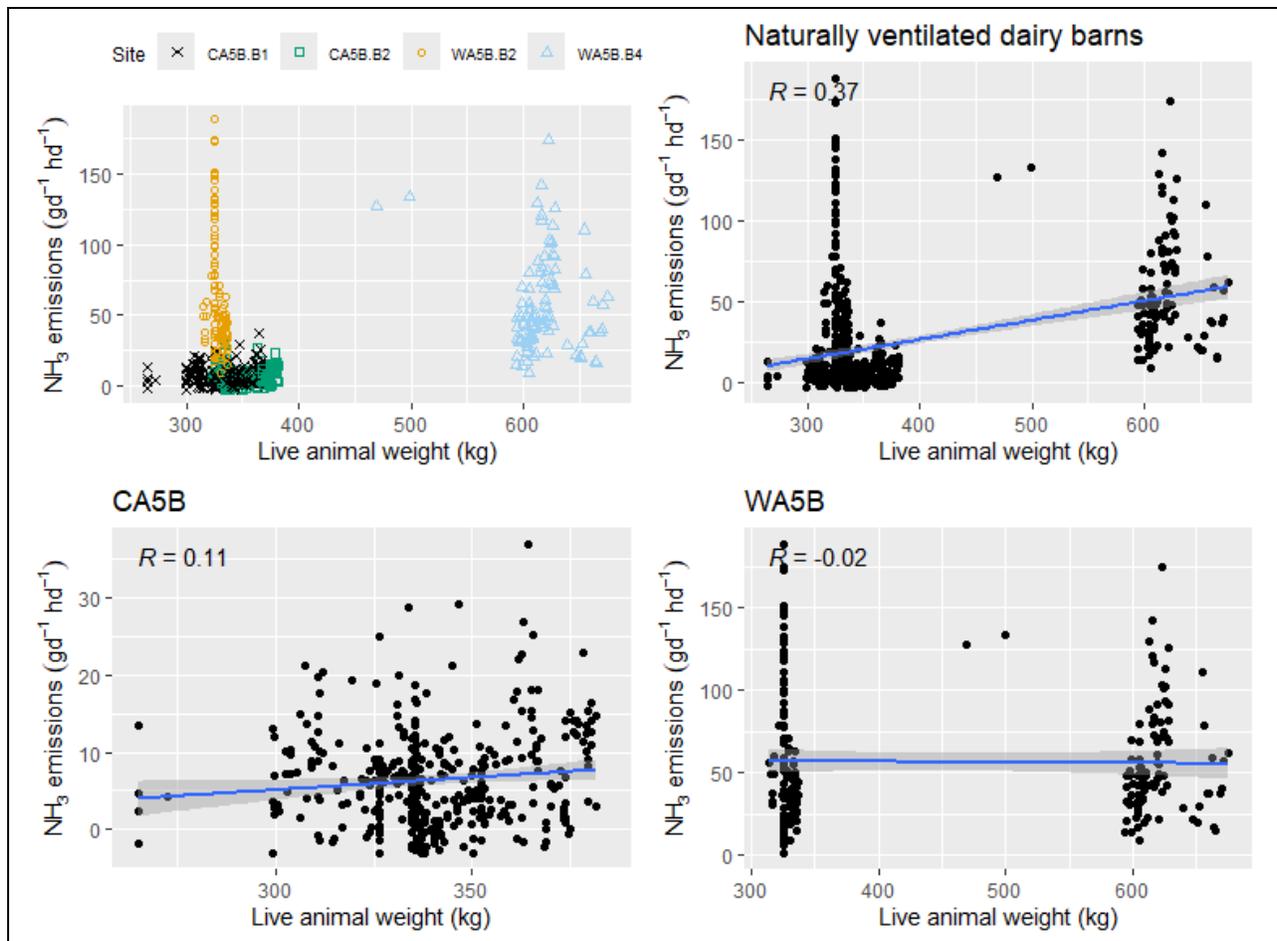


Figure 3.6: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus live animal weight.

3.1.1.4 Exhaust temperature

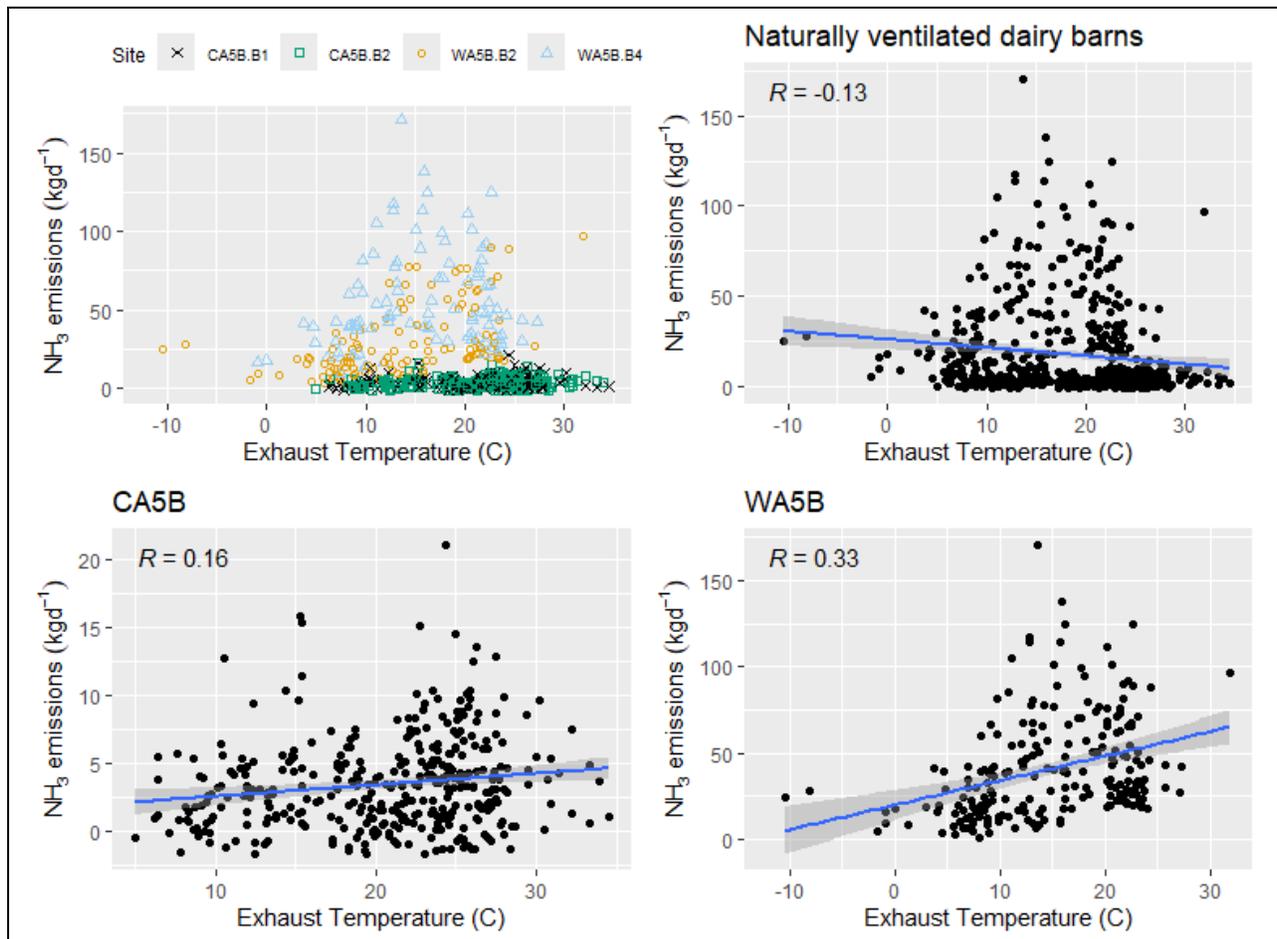


Figure 3.7: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus exhaust temperature.

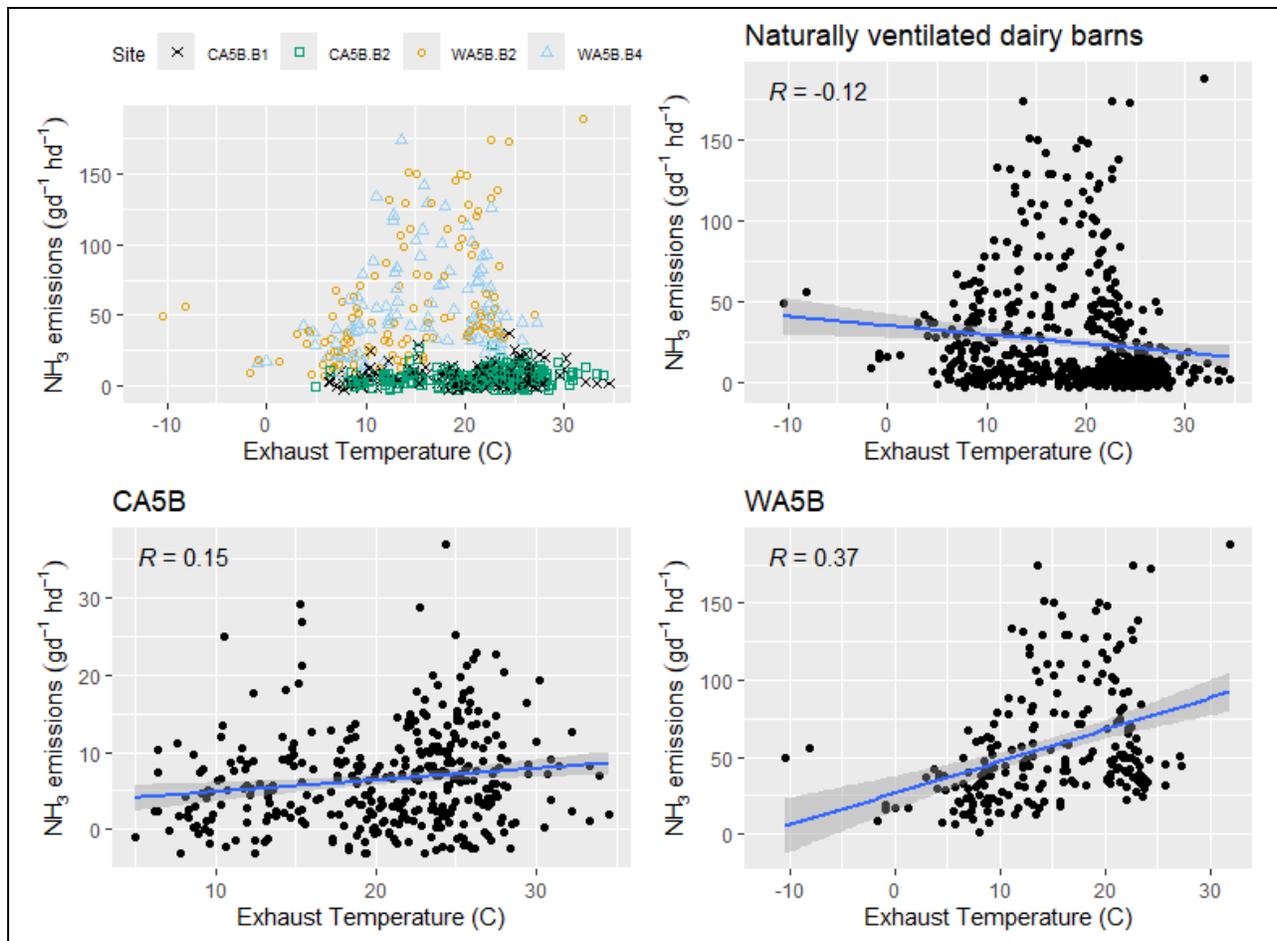


Figure 3.8: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus exhaust temperature.

3.1.1.5 Exhaust relative humidity

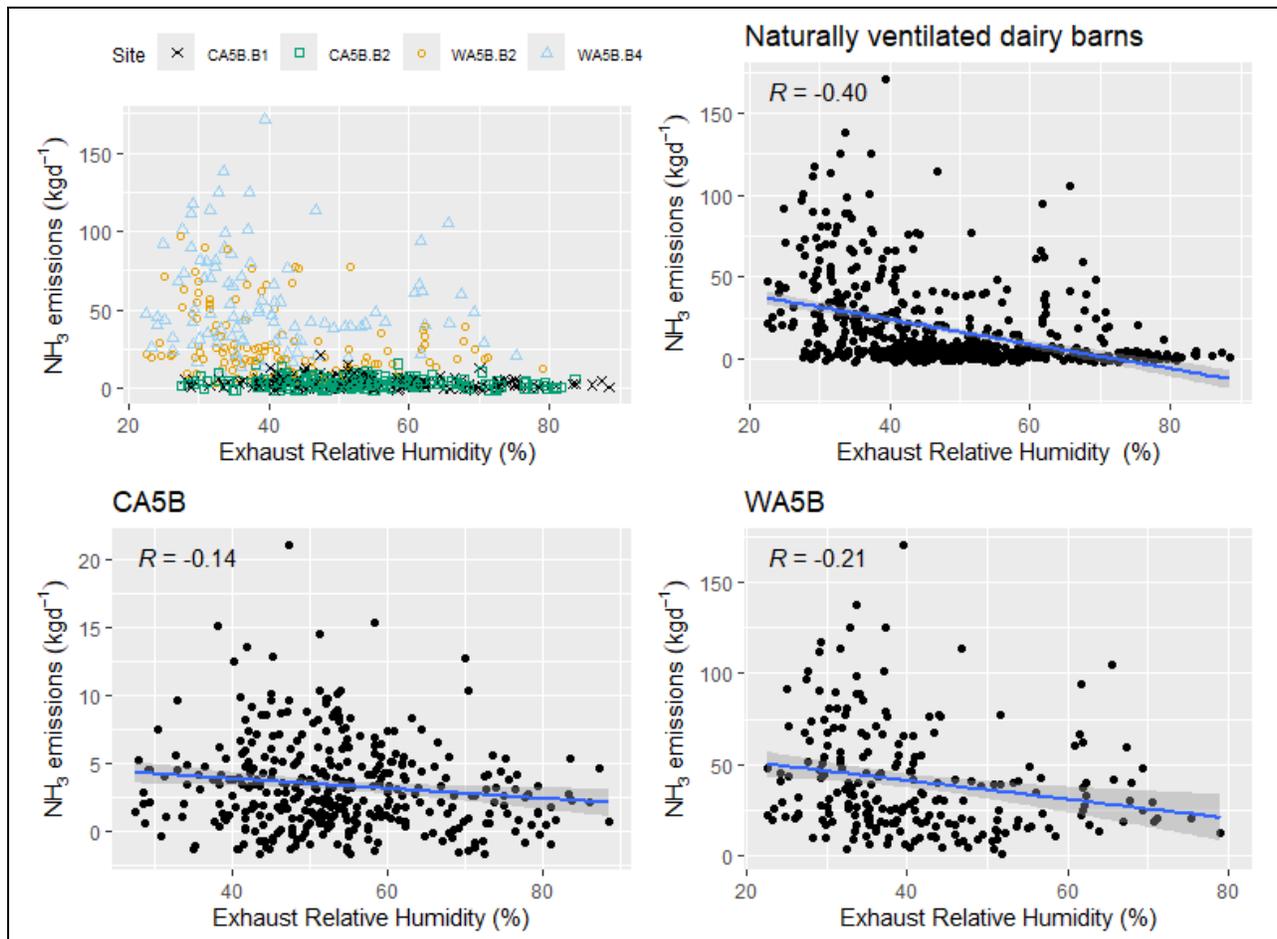


Figure 3.9: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus exhaust relative humidity.

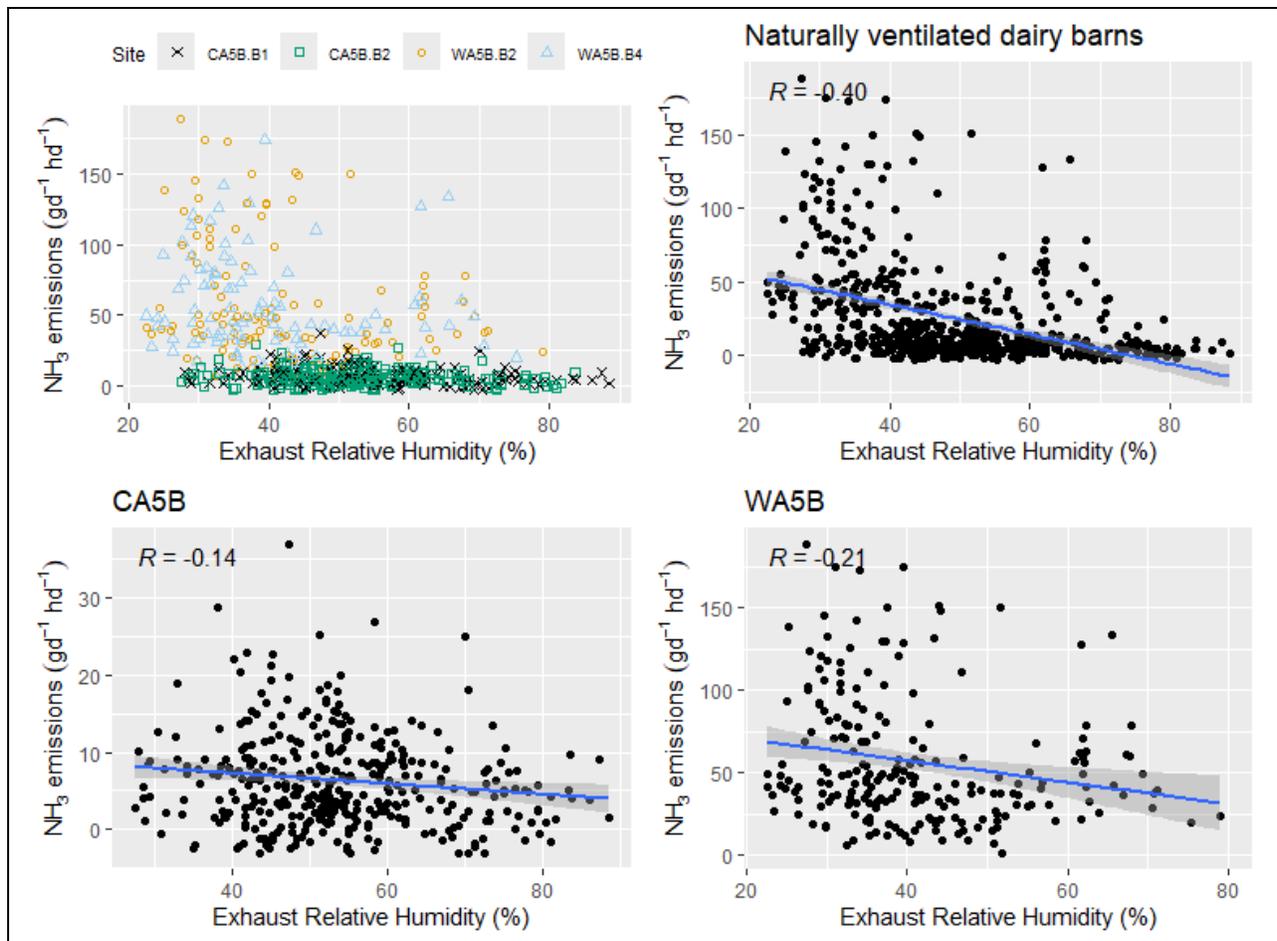


Figure 3.10: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus exhaust relative humidity.

3.1.1.6 Airflow

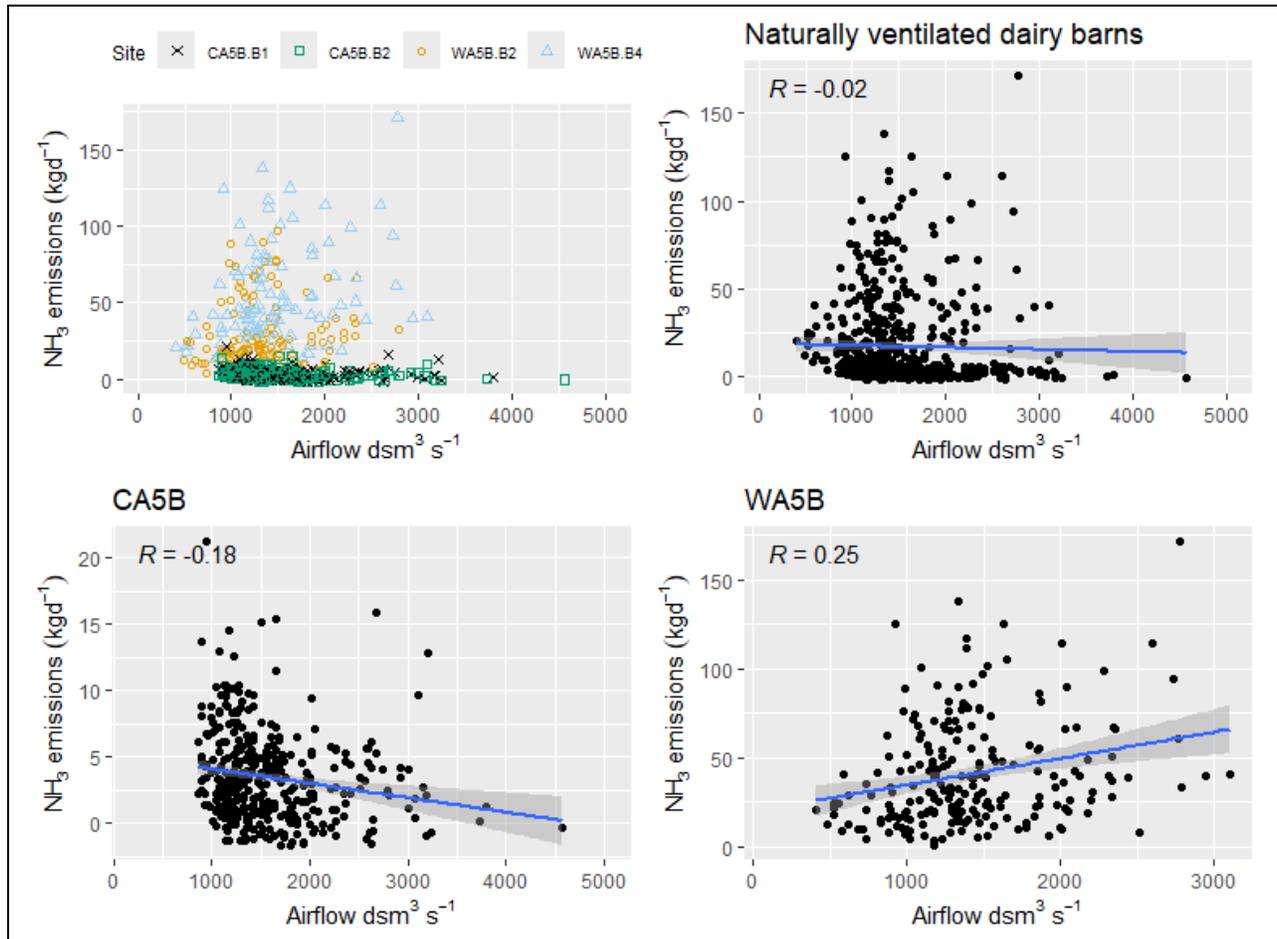
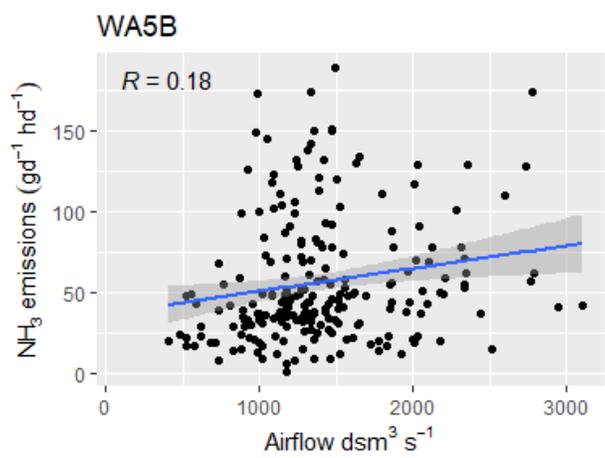
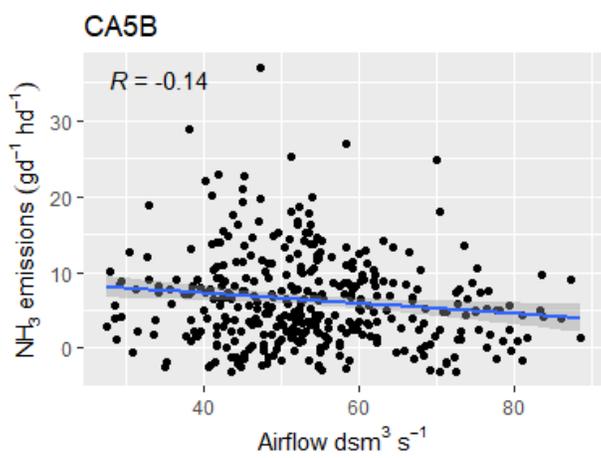
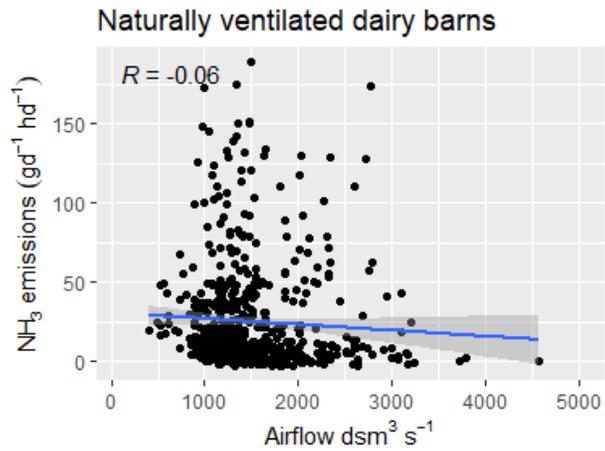
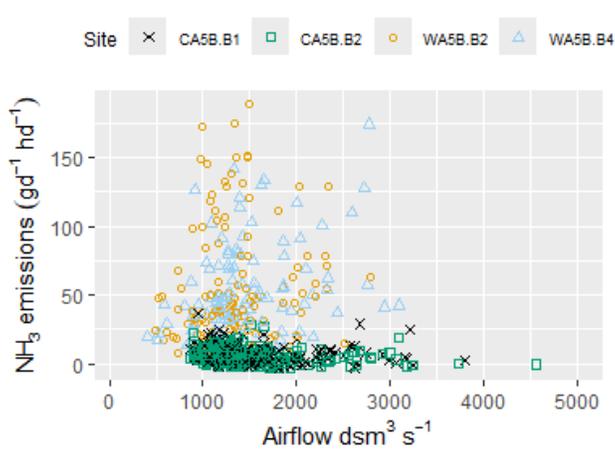


Figure 3.11: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus airflow.



Hydrogen Sulfide (H₂S) ##### Inventory

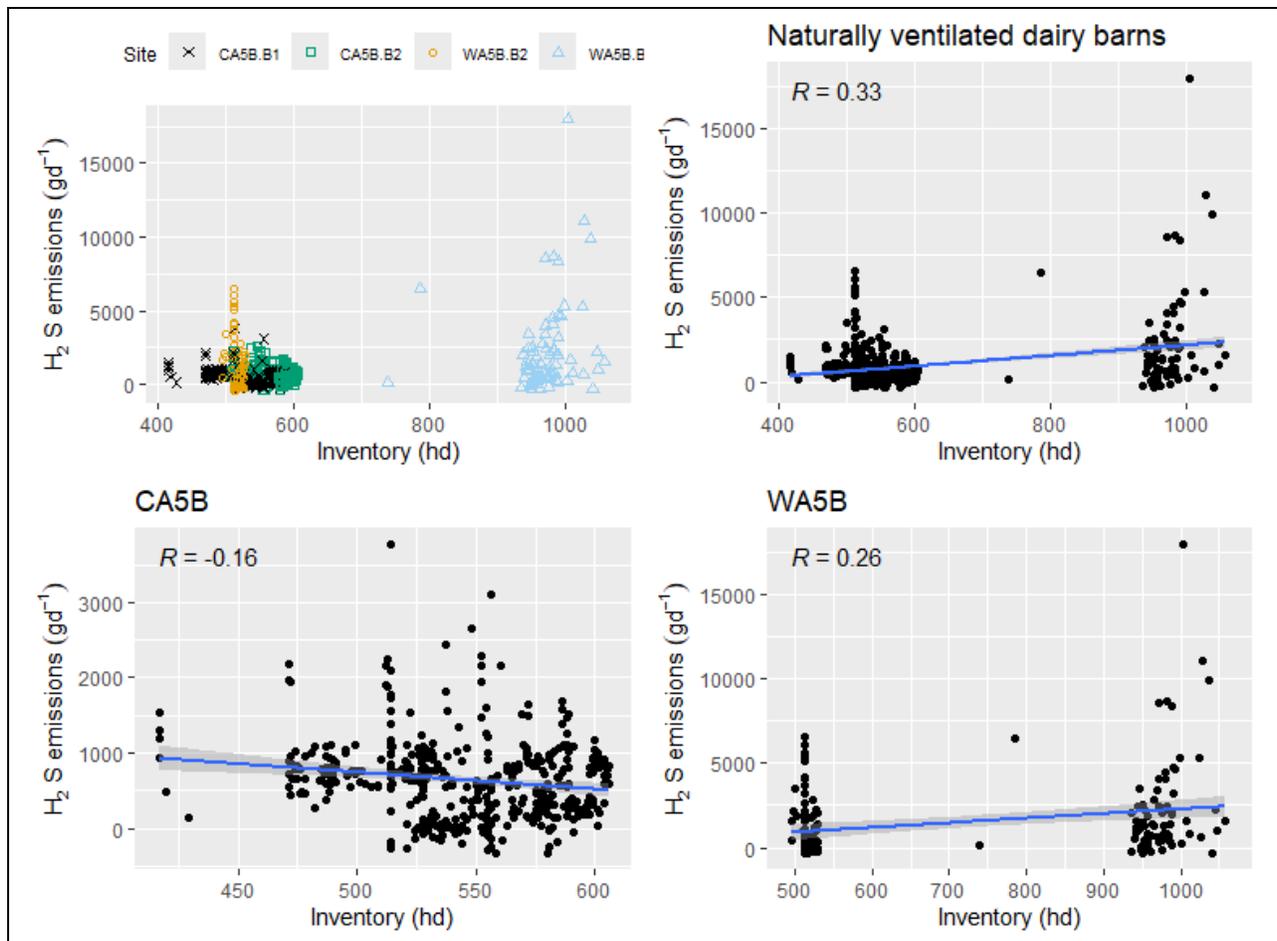


Figure 3.13: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus Inventory.

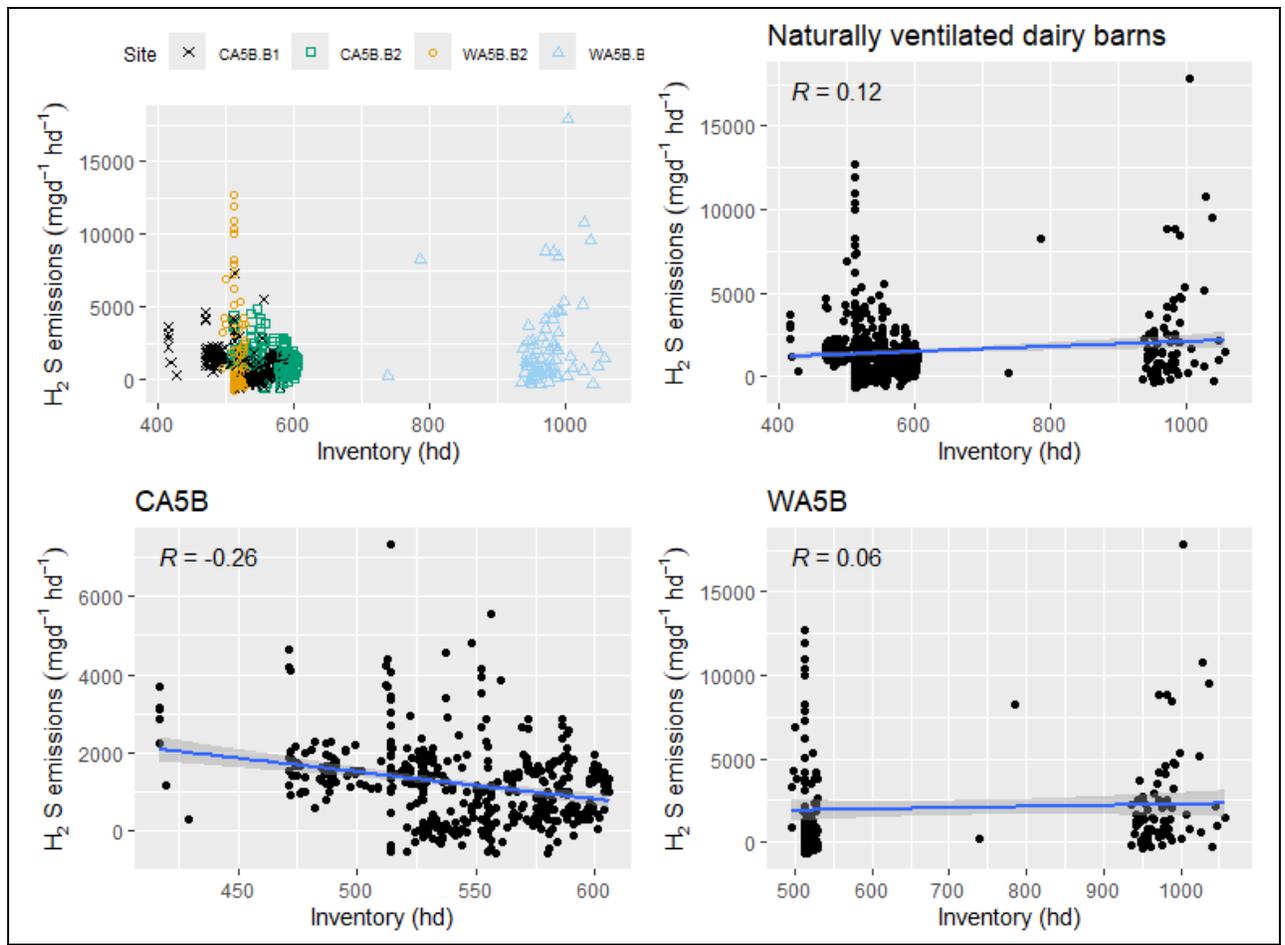


Figure 3.14: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus Inventory.

3.1.2 Hydrogen Sulfide (H₂S)

3.1.2.1 Average animal weight

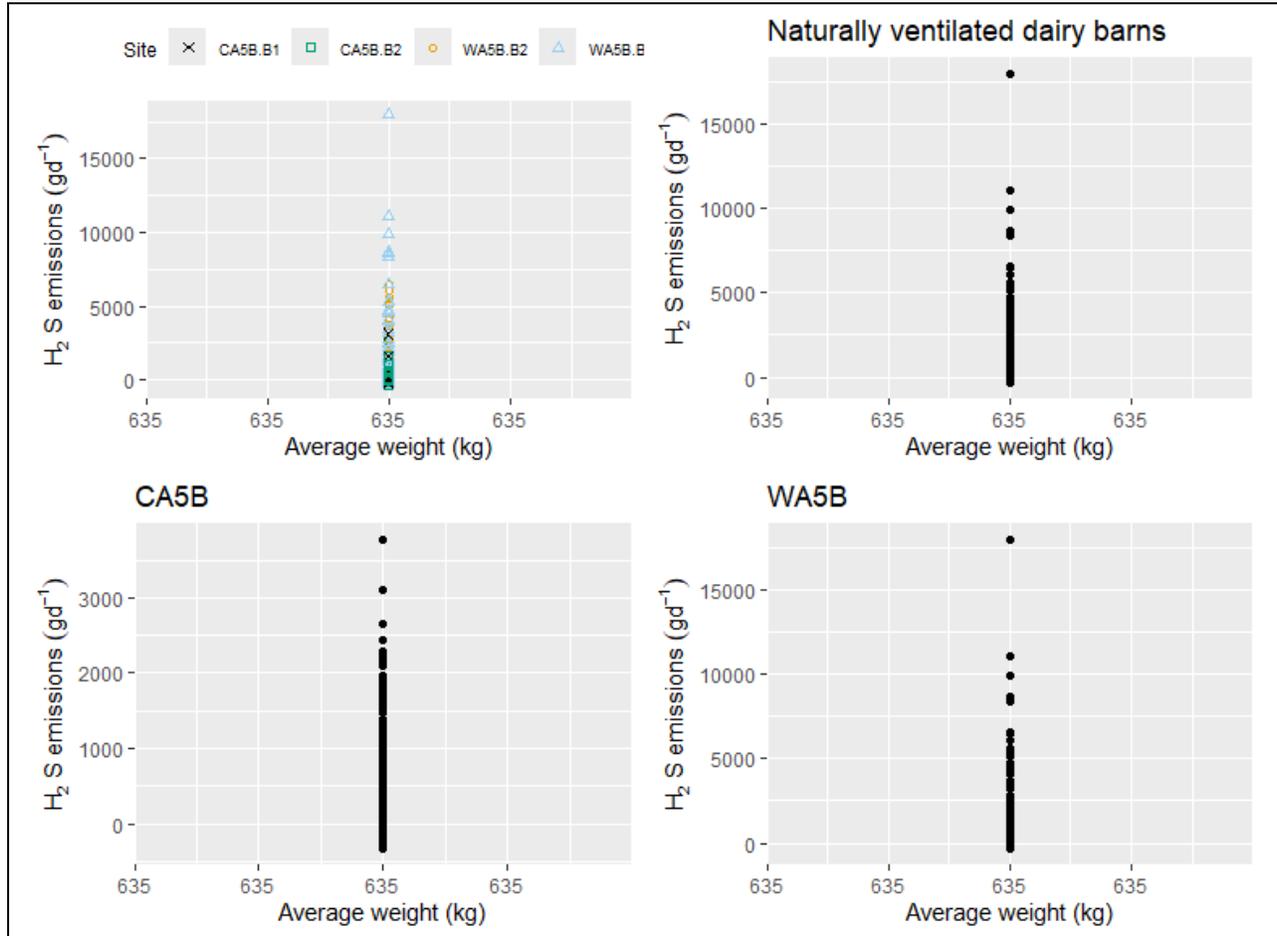


Figure 3.15: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus average animal weight.

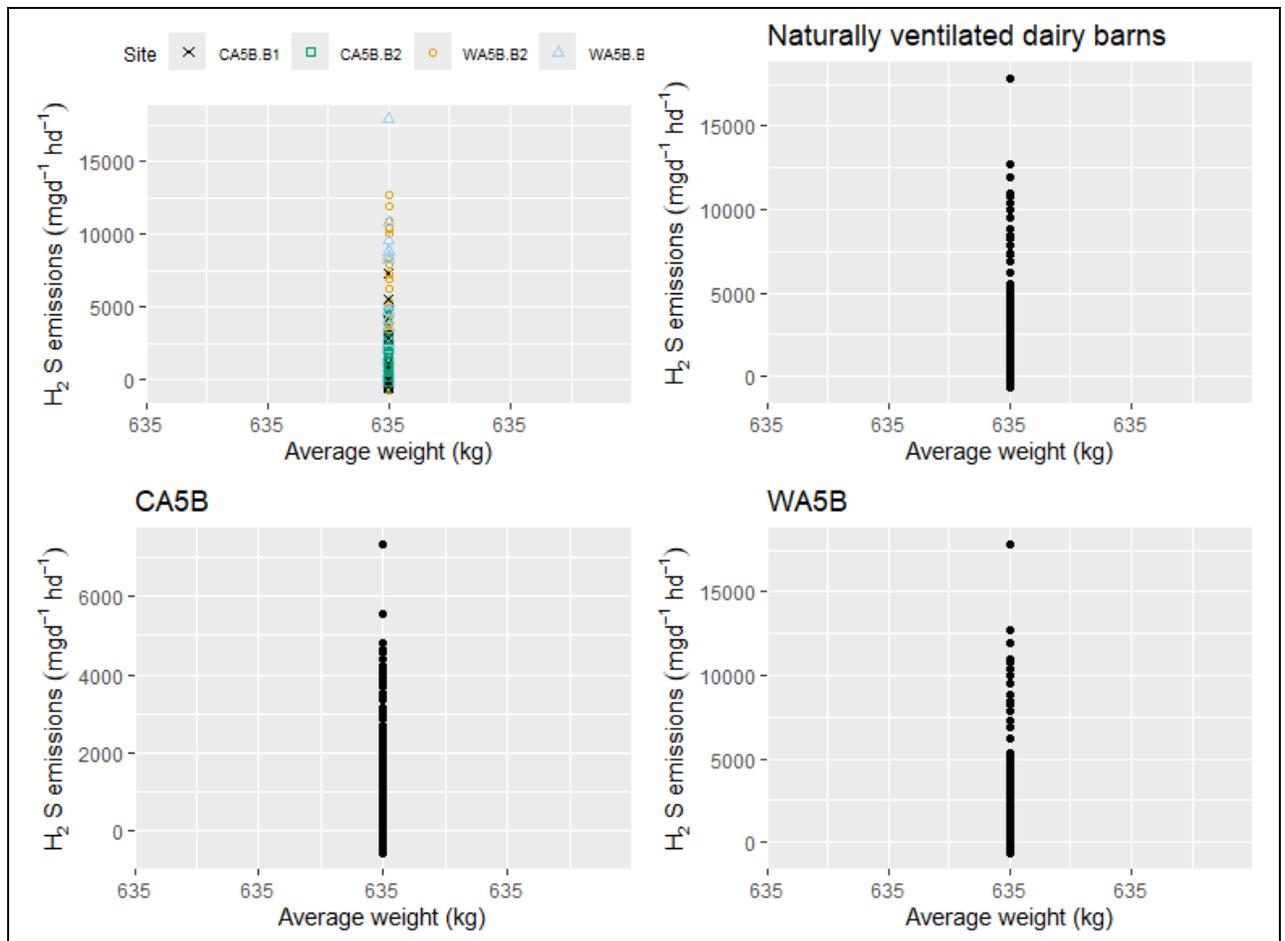


Figure 3.16: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus average animal weight.

3.1.2.2 *Live animal weight*

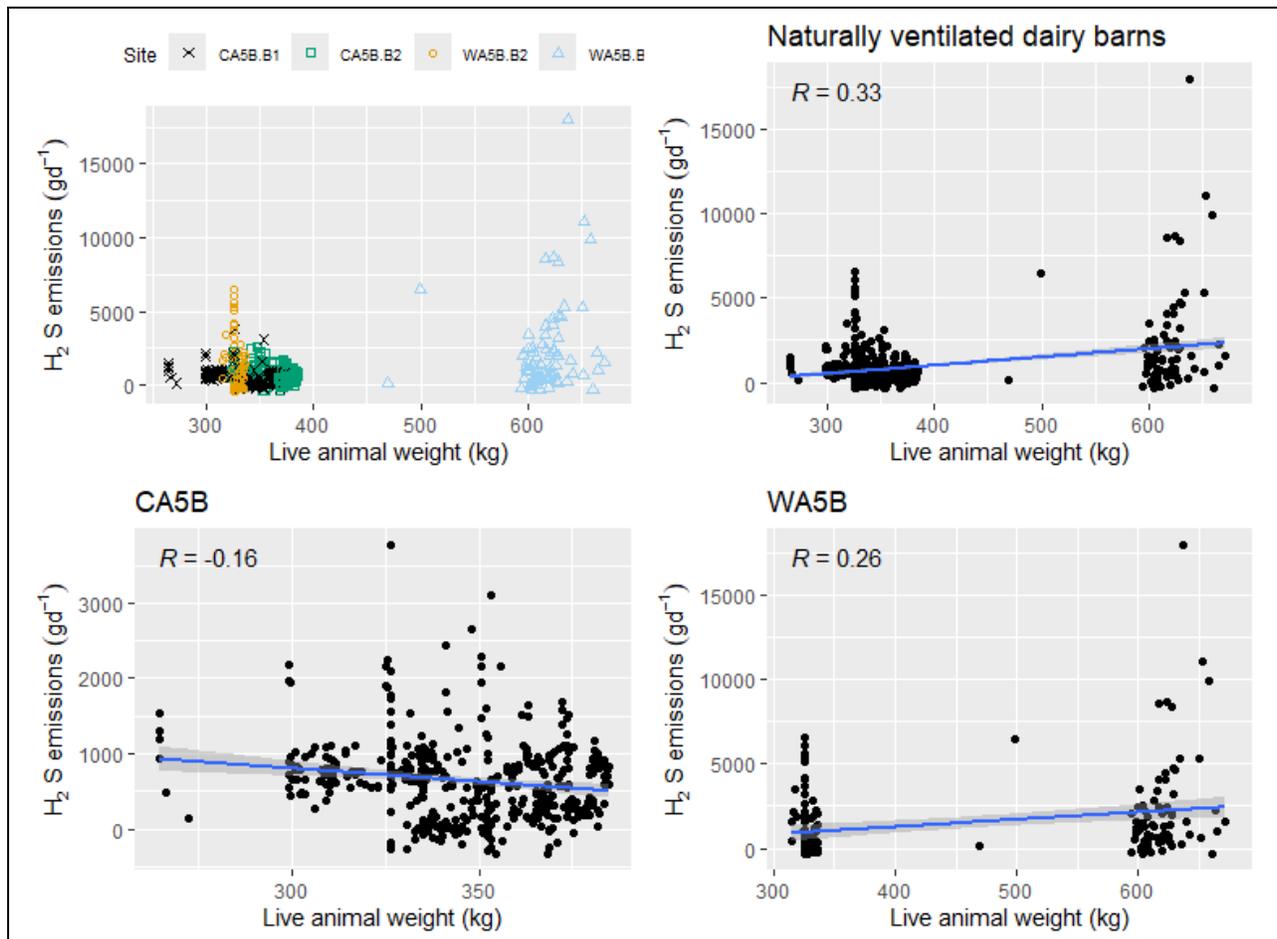


Figure 3.17: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus live animal weight.

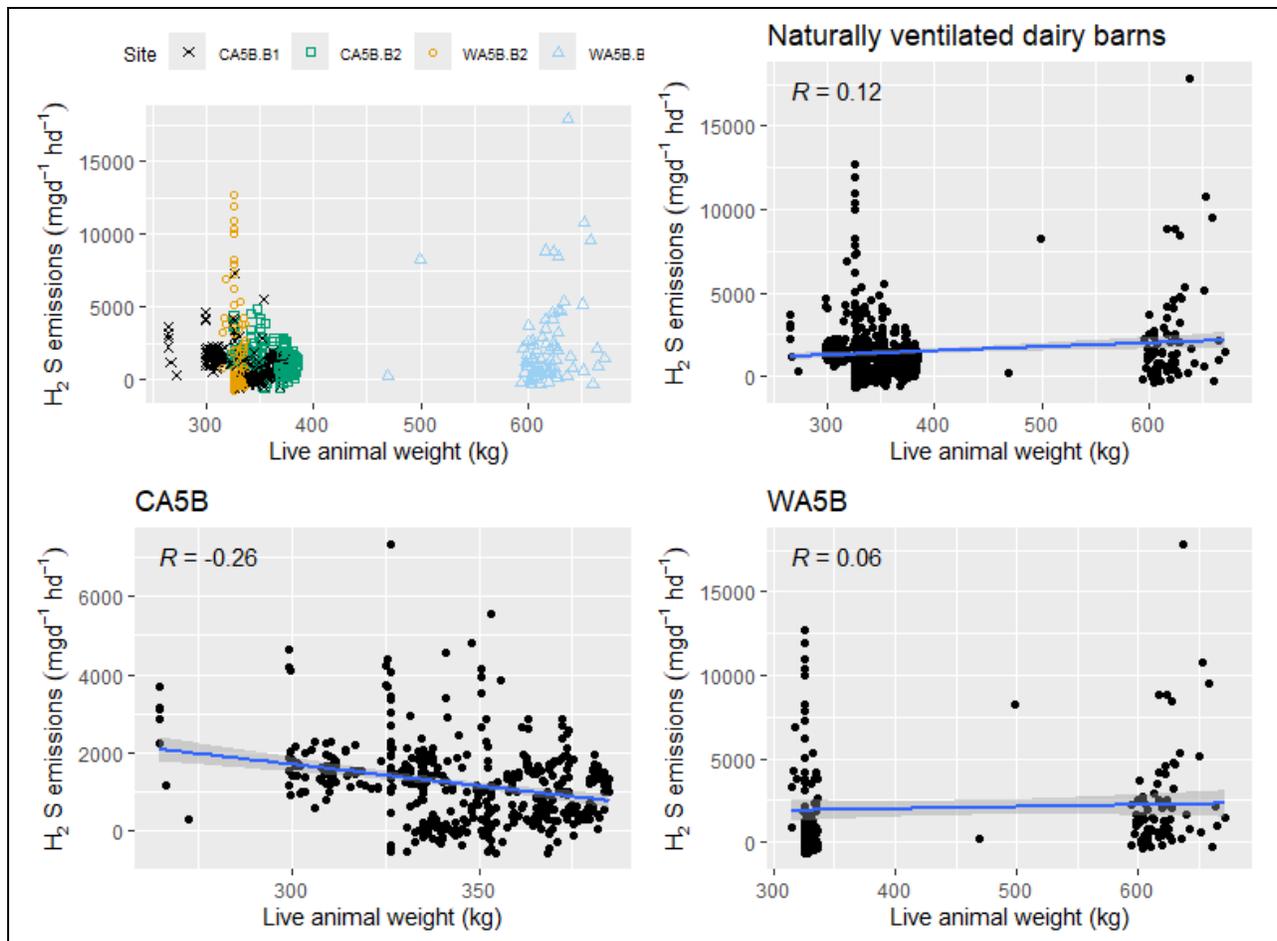


Figure 3.18: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus live animal weight.

3.1.2.3 Exhaust temperature

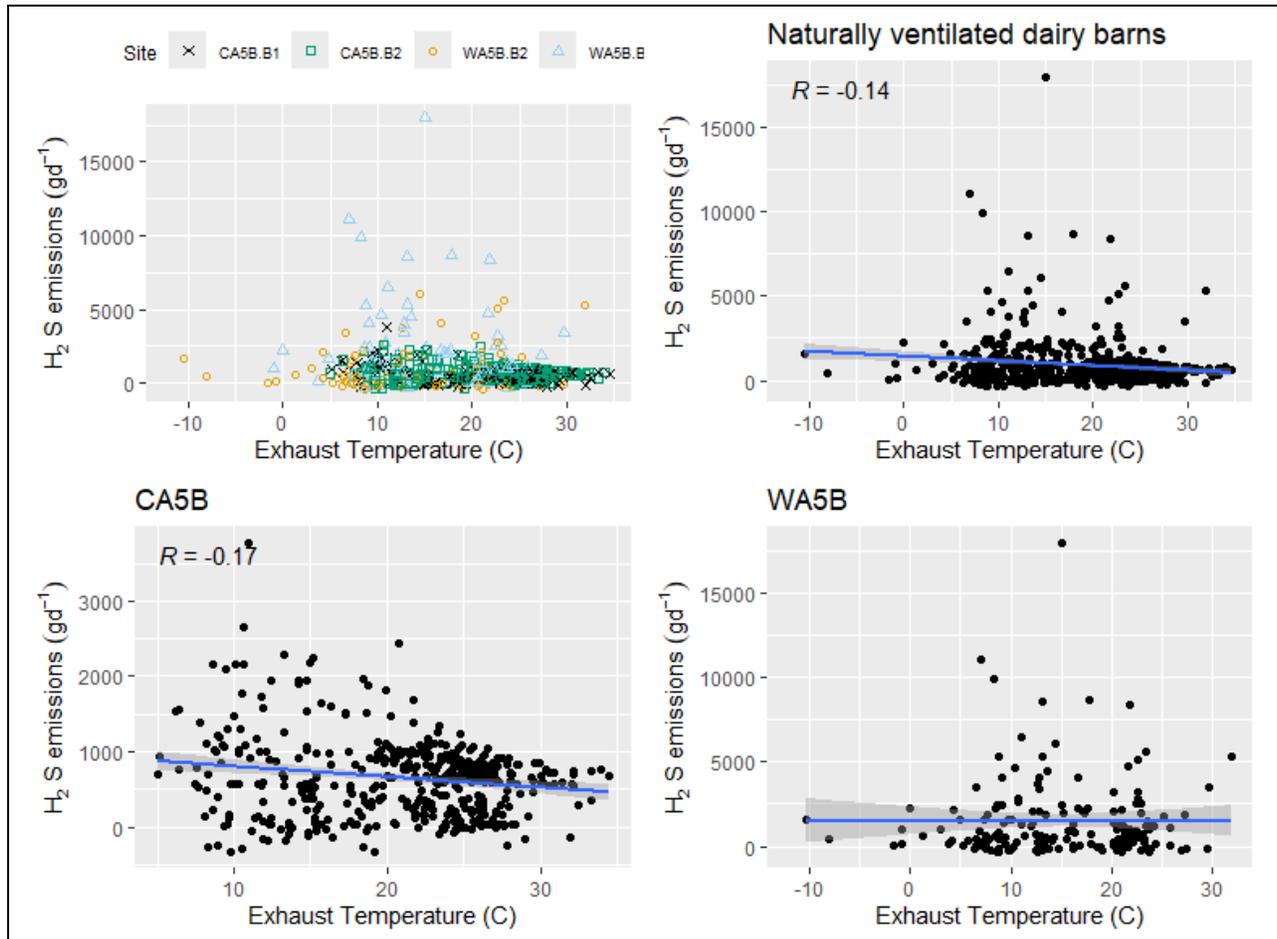


Figure 3.19: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus exhaust temperature.

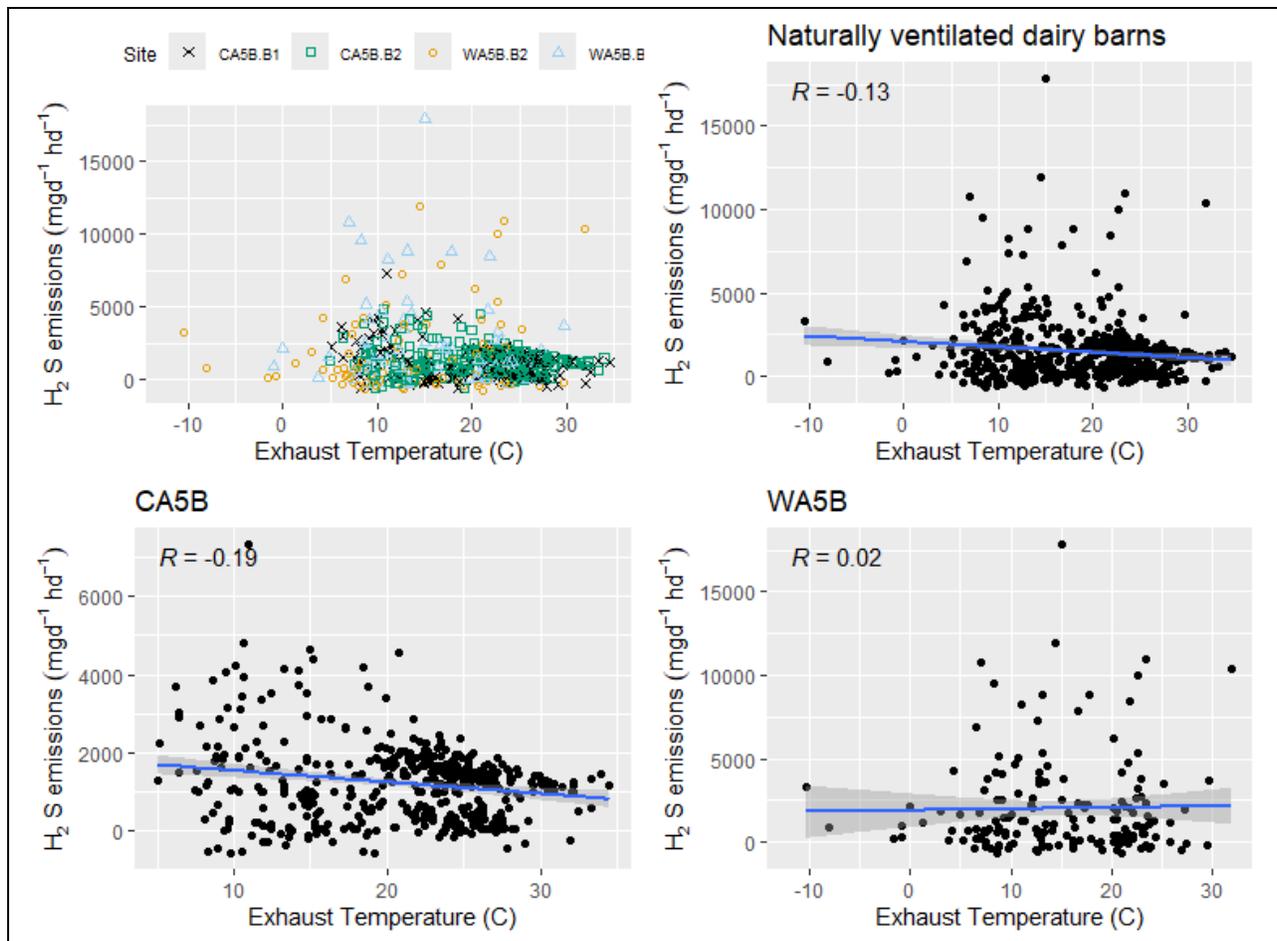


Figure 3.20: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

3.1.2.4 Exhaust relative humidity

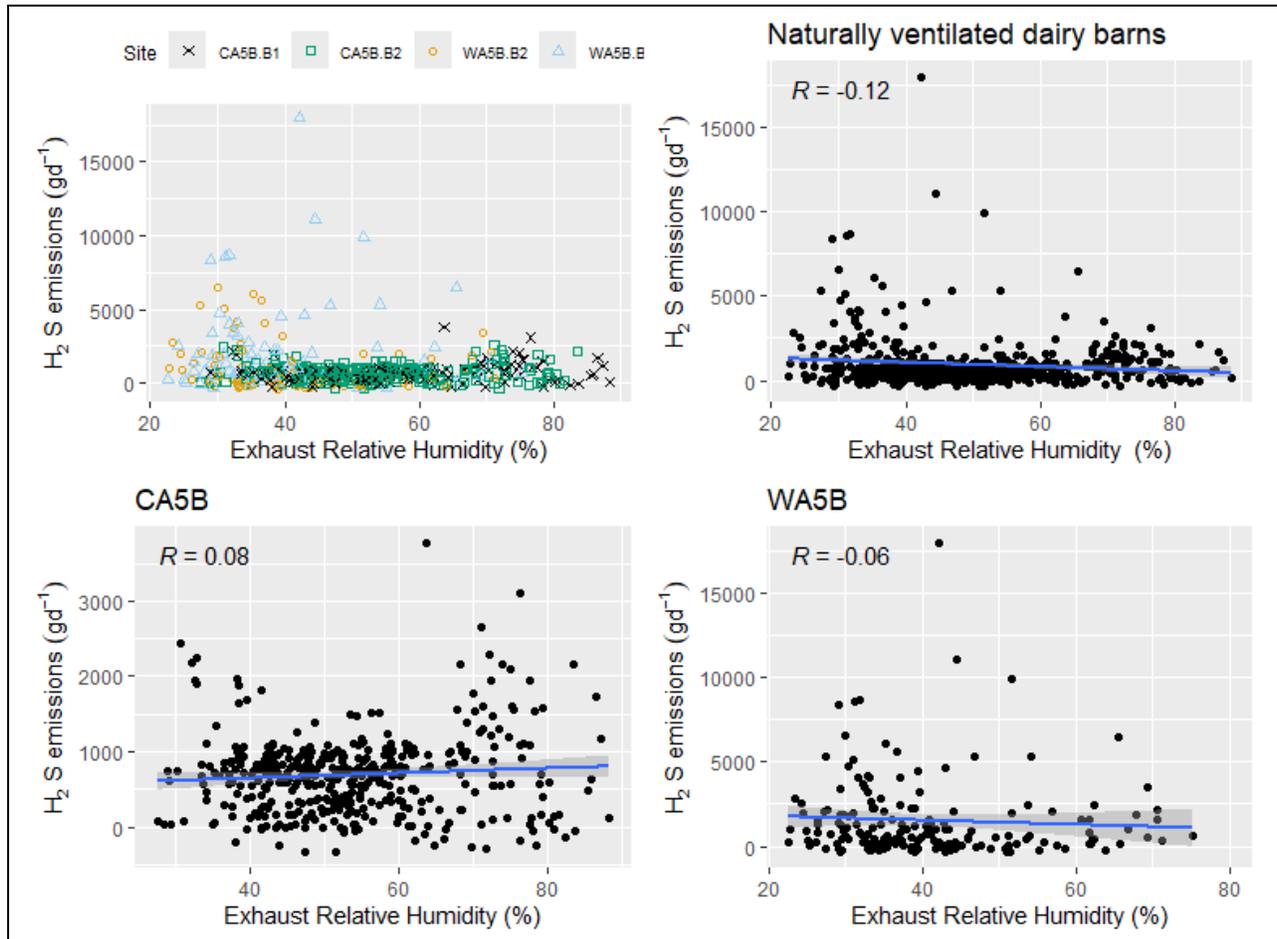


Figure 3.21: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus exhaust relative humidity.

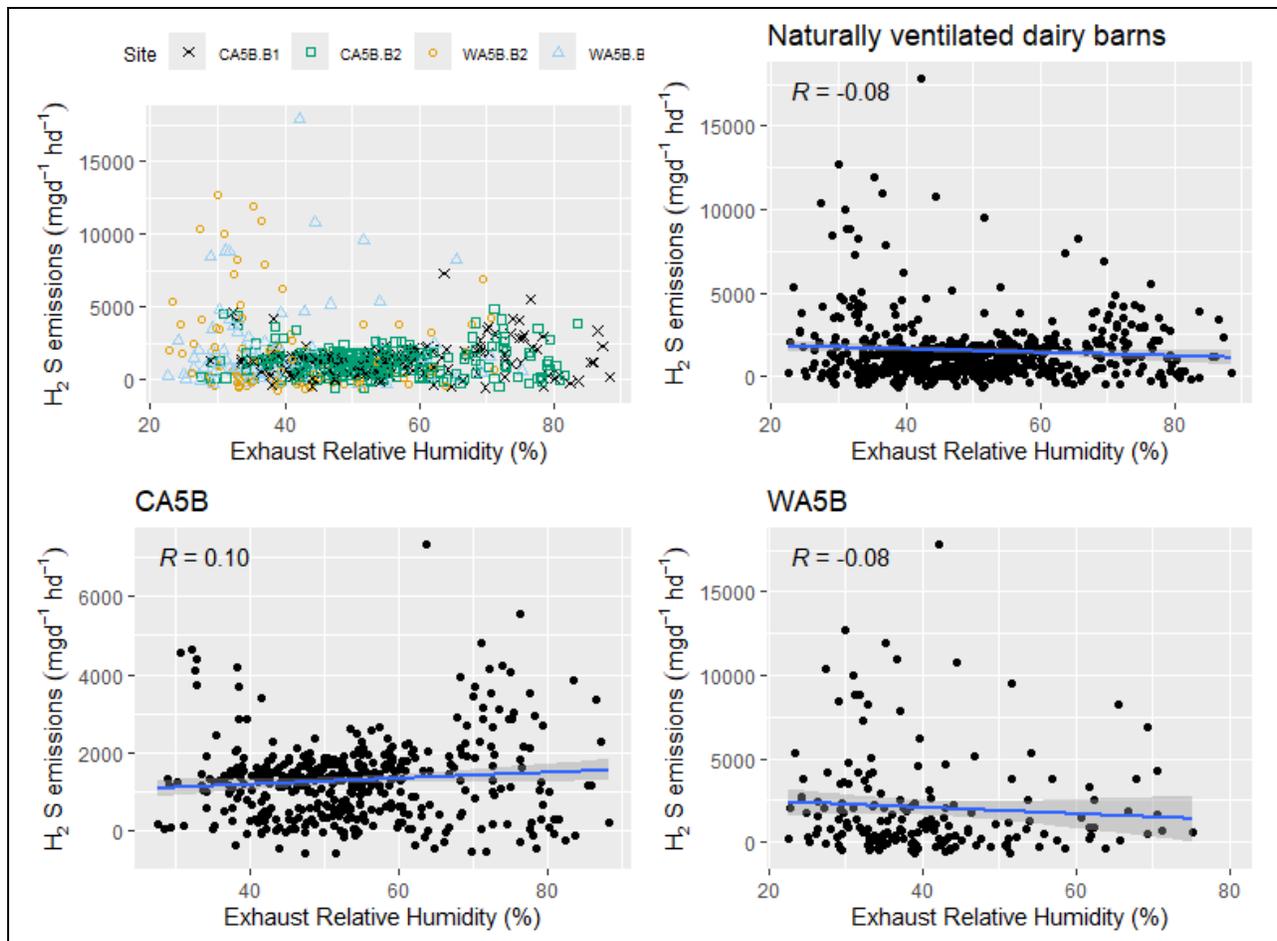


Figure 3.22: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

3.1.2.5 Airflow

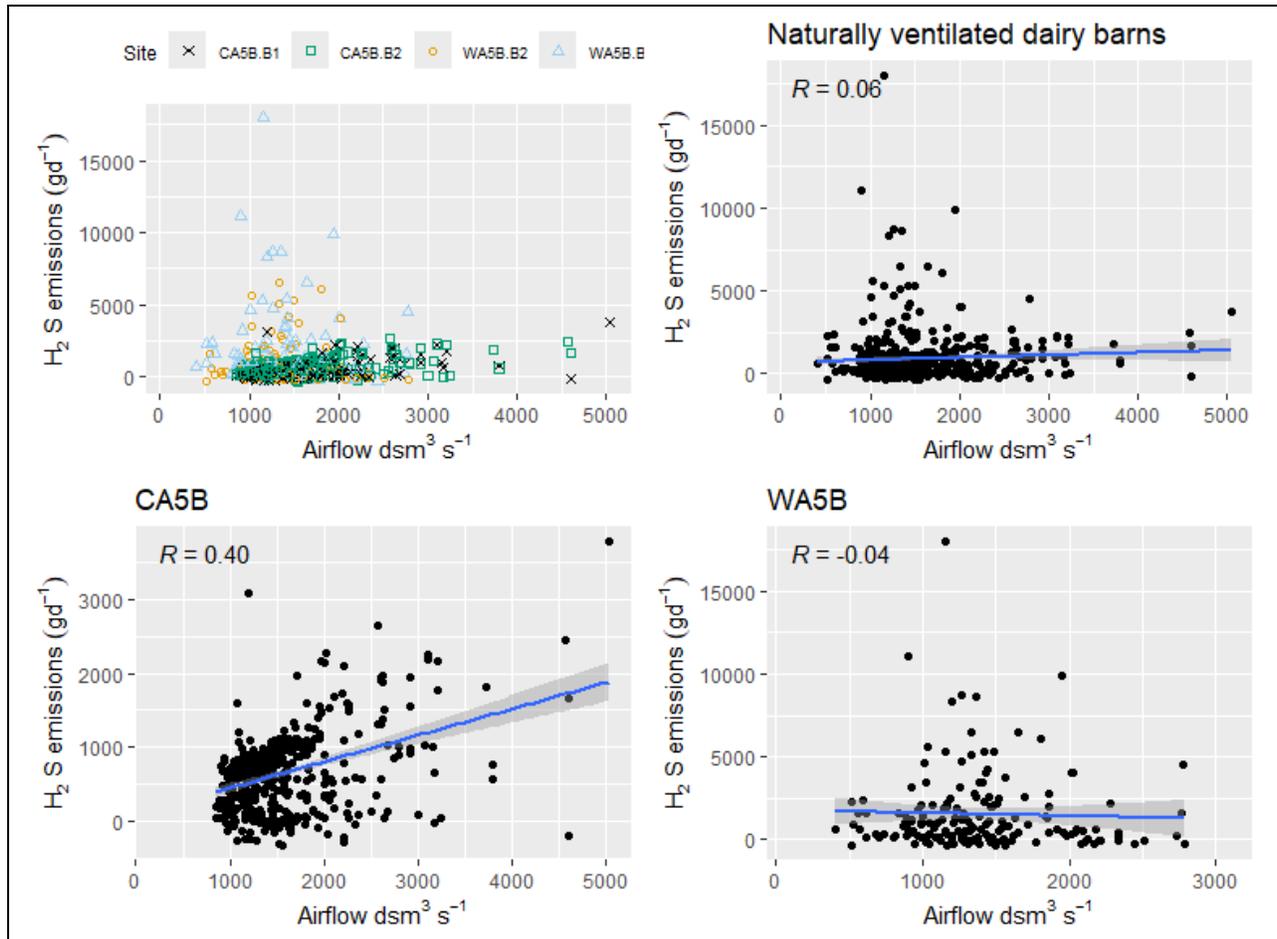


Figure 3.23: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus airflow.

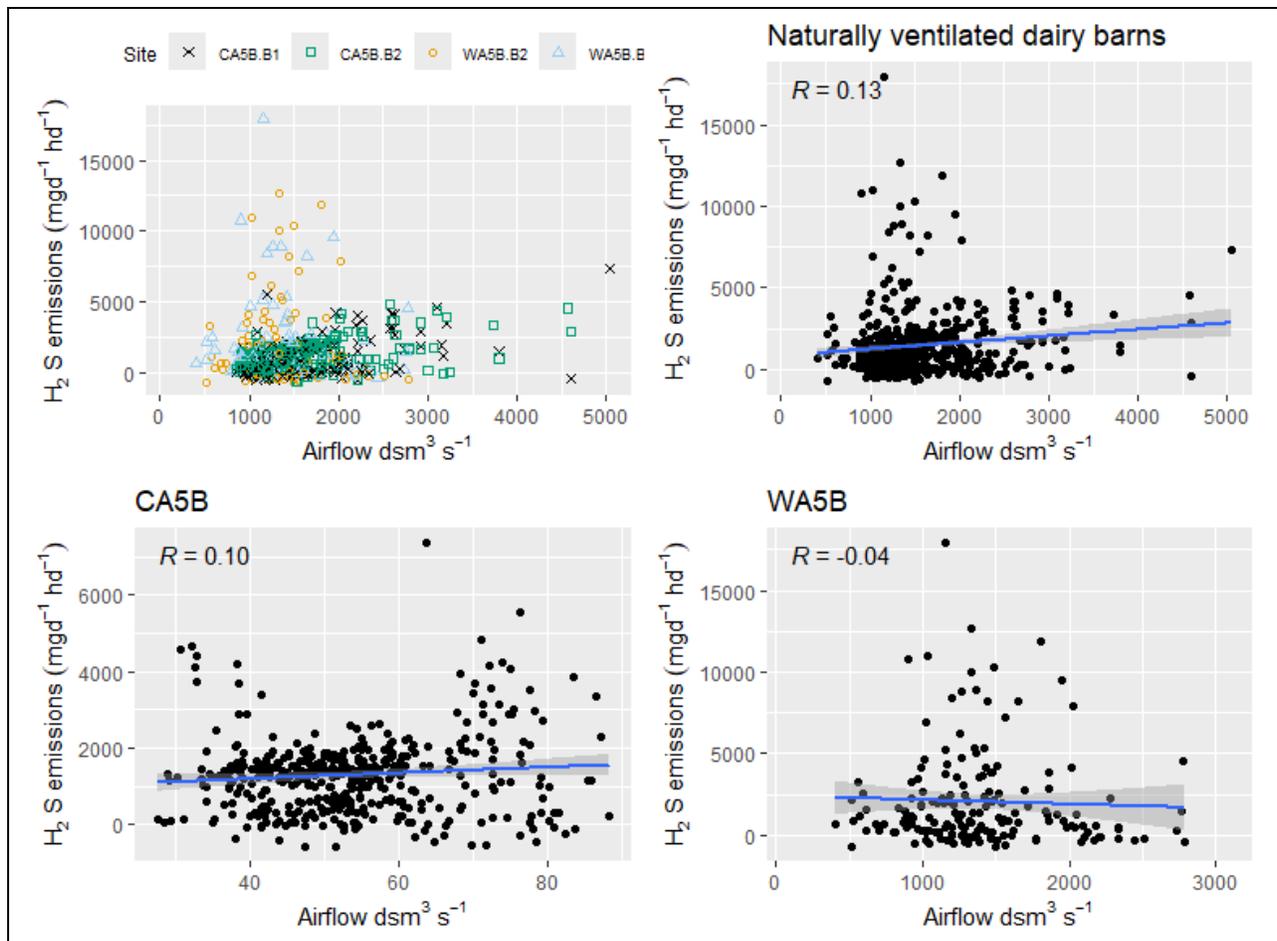


Figure 3.24: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus airflow.

3.1.2 Particulate Matter (PM₁₀)

3.1.2.1 Inventory

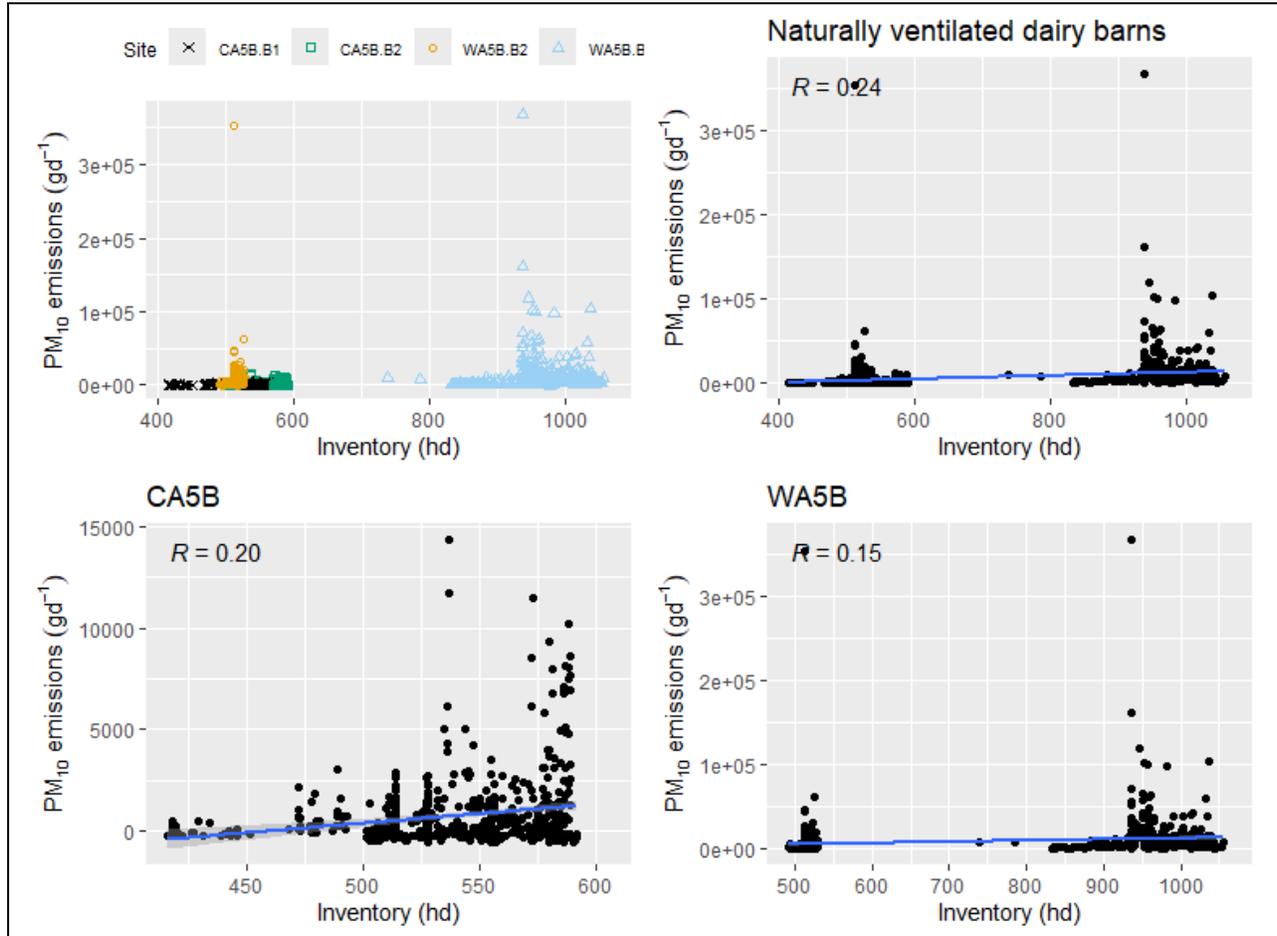


Figure 3.25: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus Inventory.

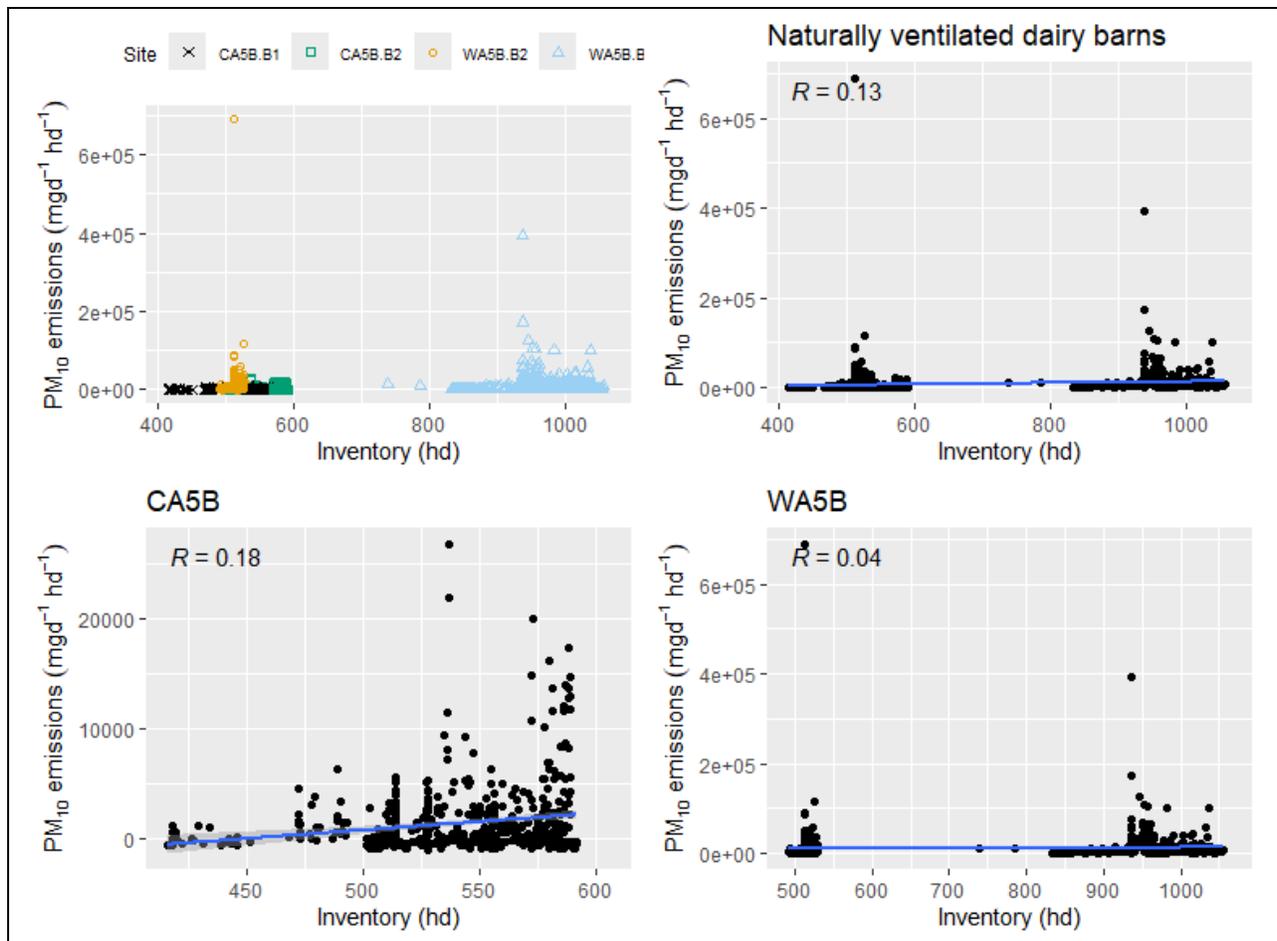


Figure 3.26: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus Inventory.

3.1.2.2 Average animal weight

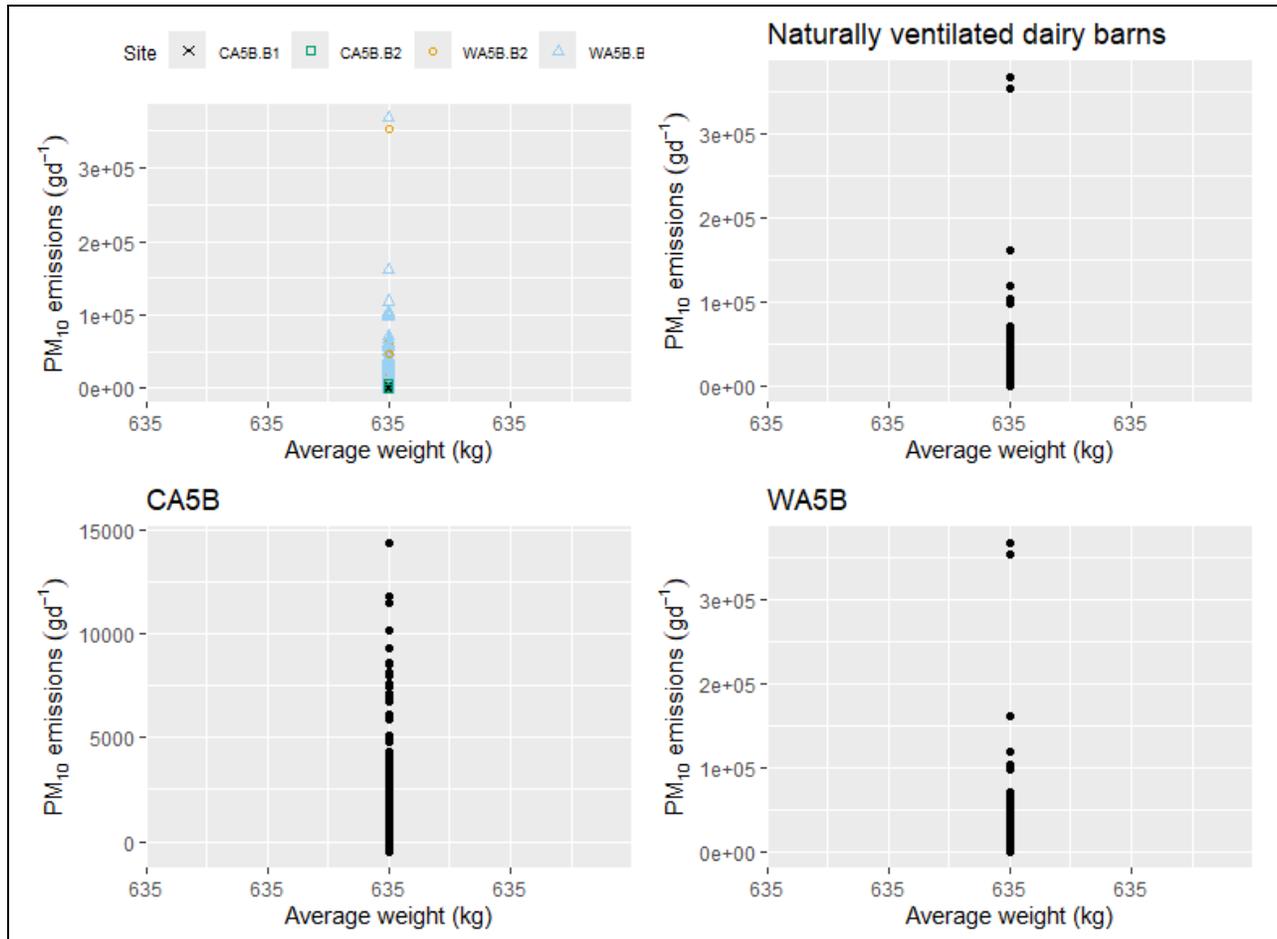


Figure 3.27: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus average animal weight.

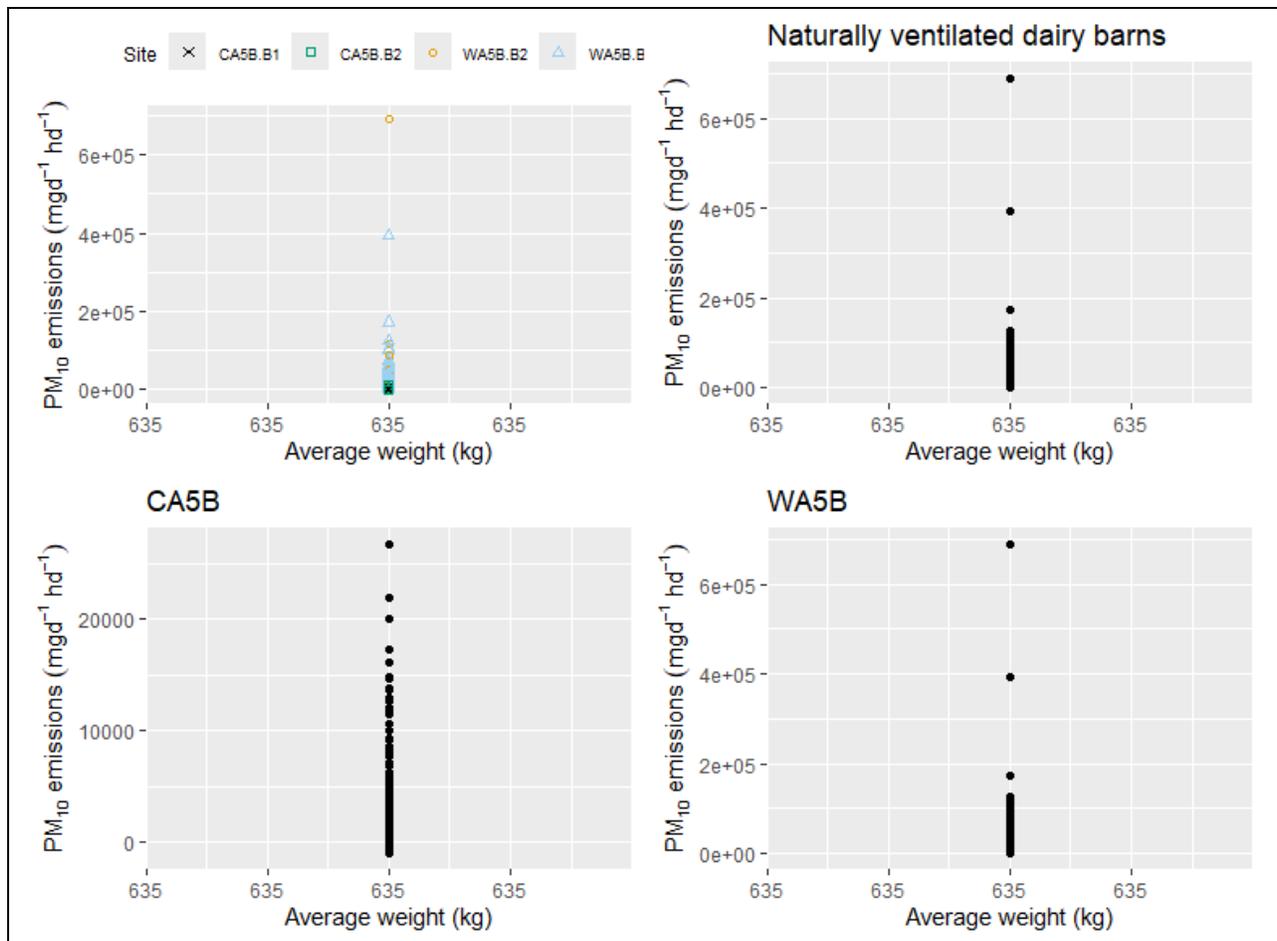


Figure 3.28: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus average animal weight.

3.1.2.3 *Live animal weight*

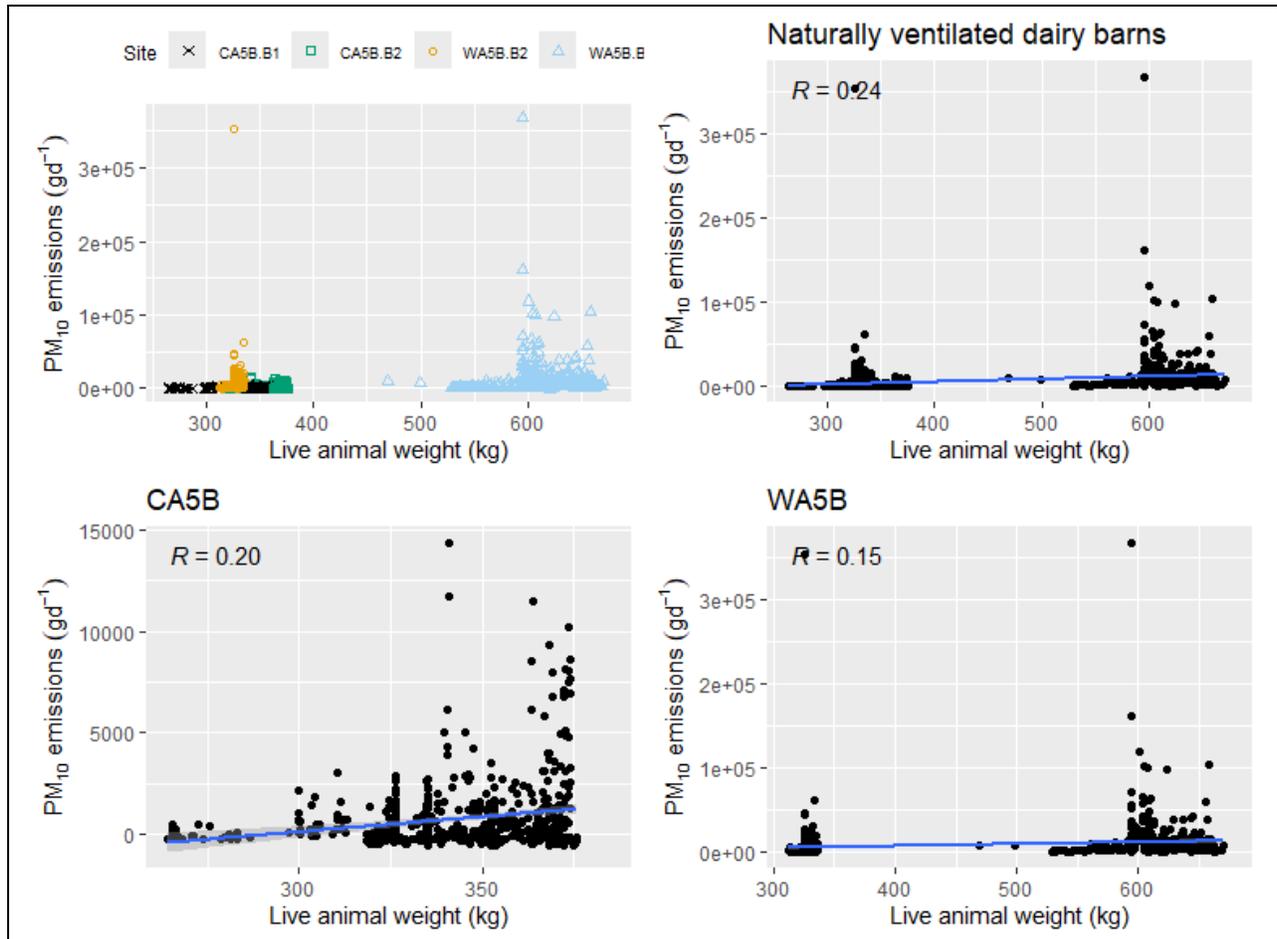


Figure 3.29: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus live animal weight.

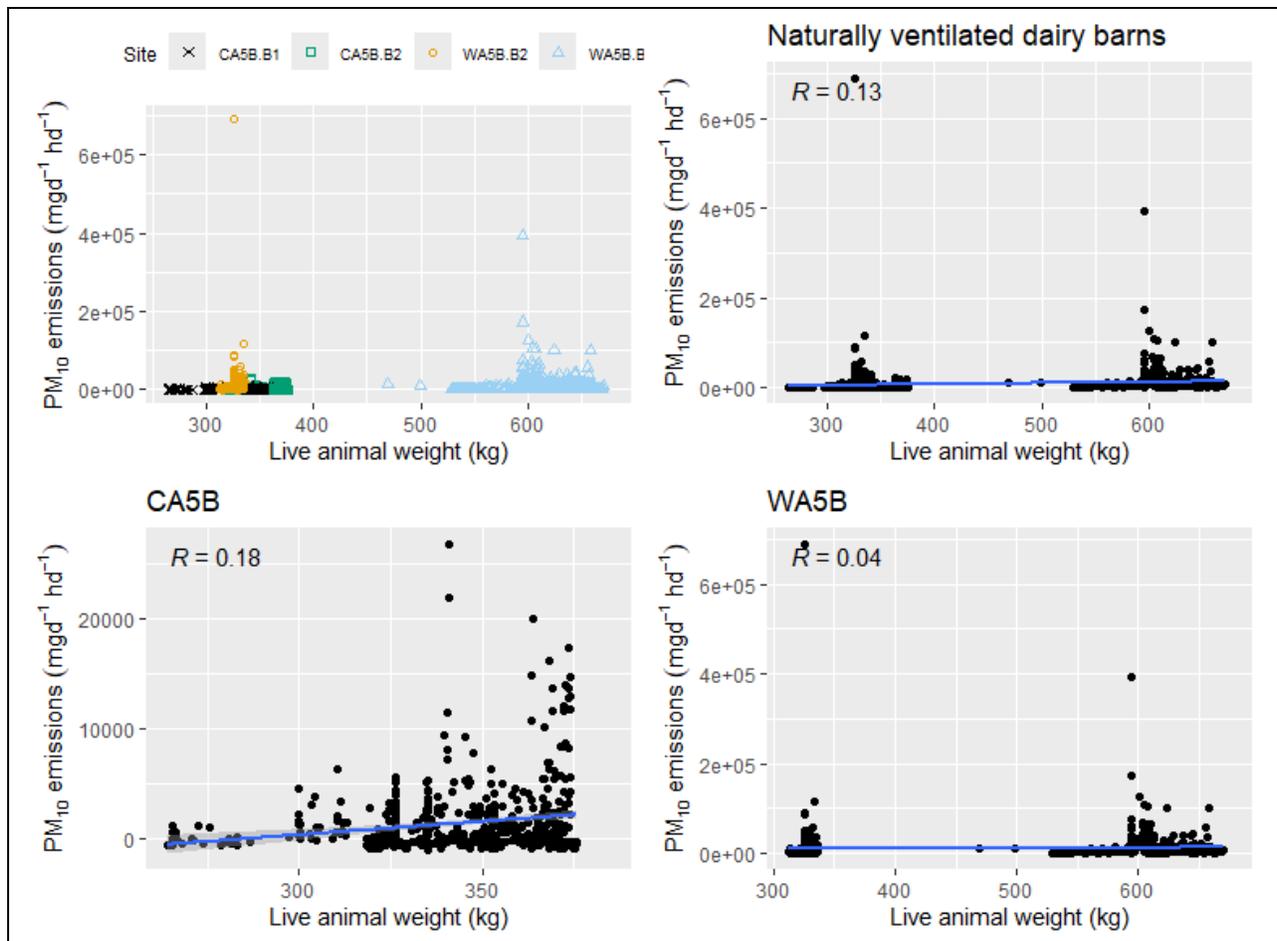


Figure 3.30: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus live animal weight.

3.1.2.4 Exhaust temperature

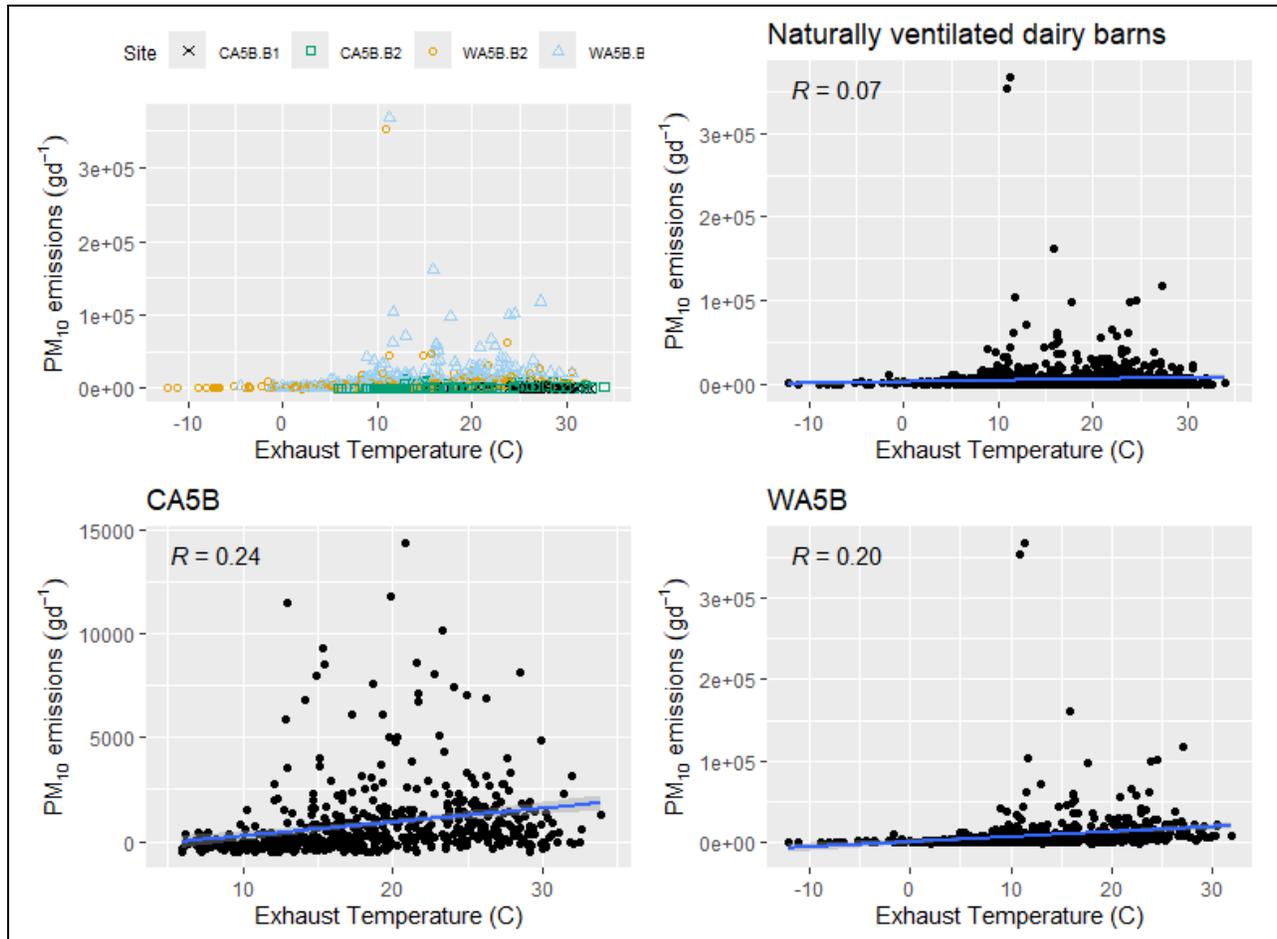


Figure 3.31: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus exhaust temperature.

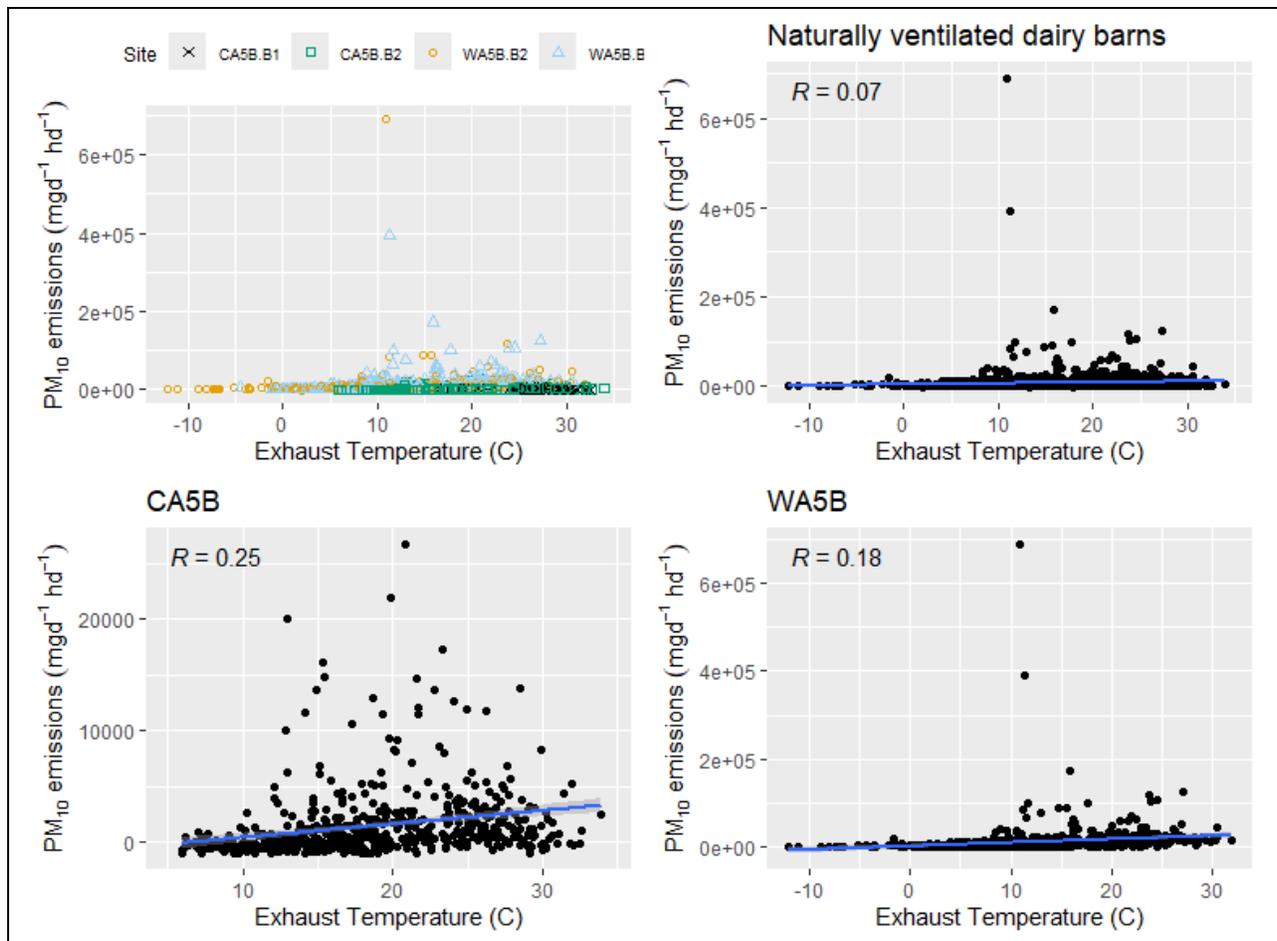


Figure 3.32: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

3.1.2.5 Exhaust relative humidity

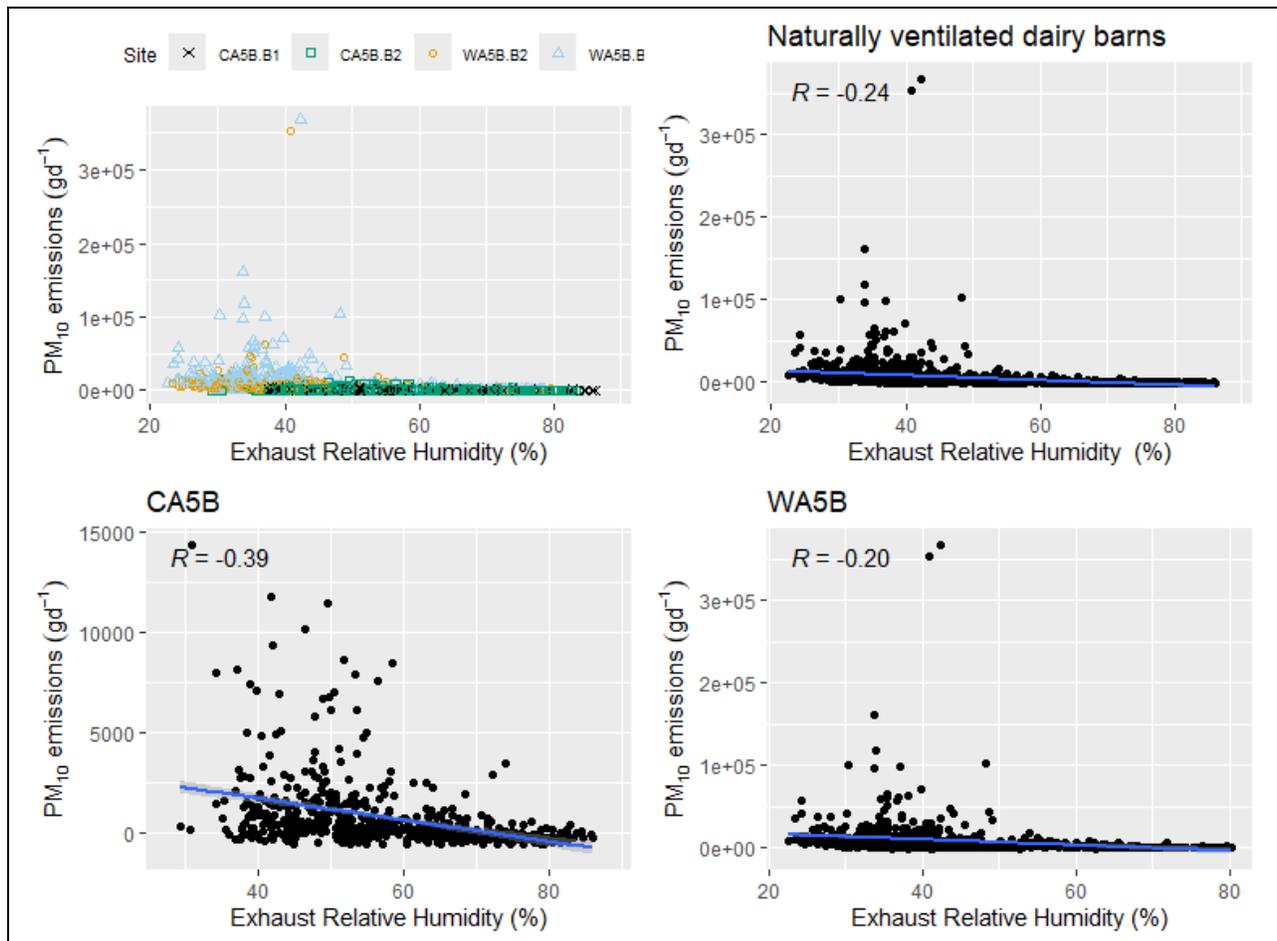


Figure 3.33: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus exhaust relative humidity.

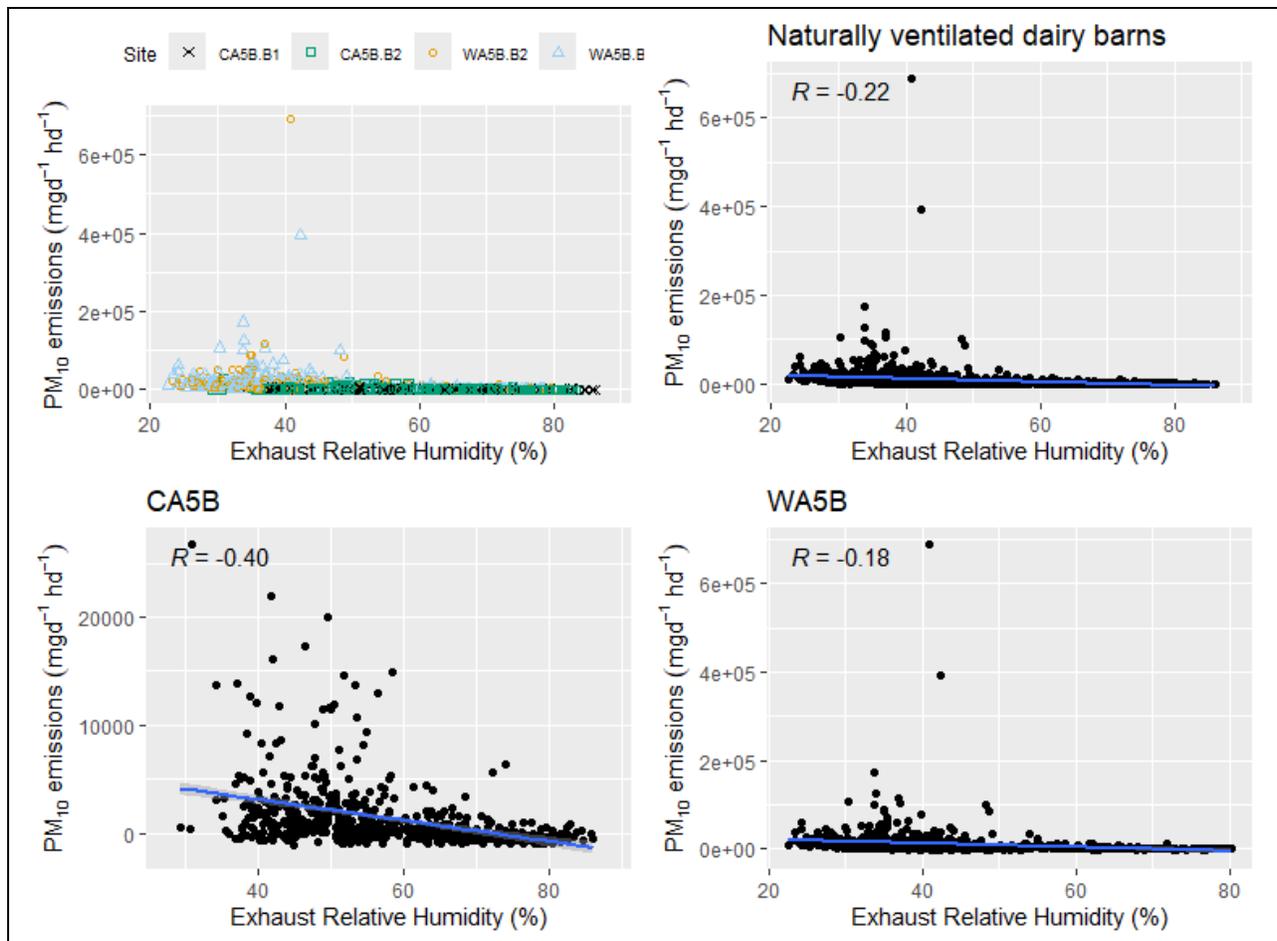


Figure 3.34: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

3.1.2.6 Airflow

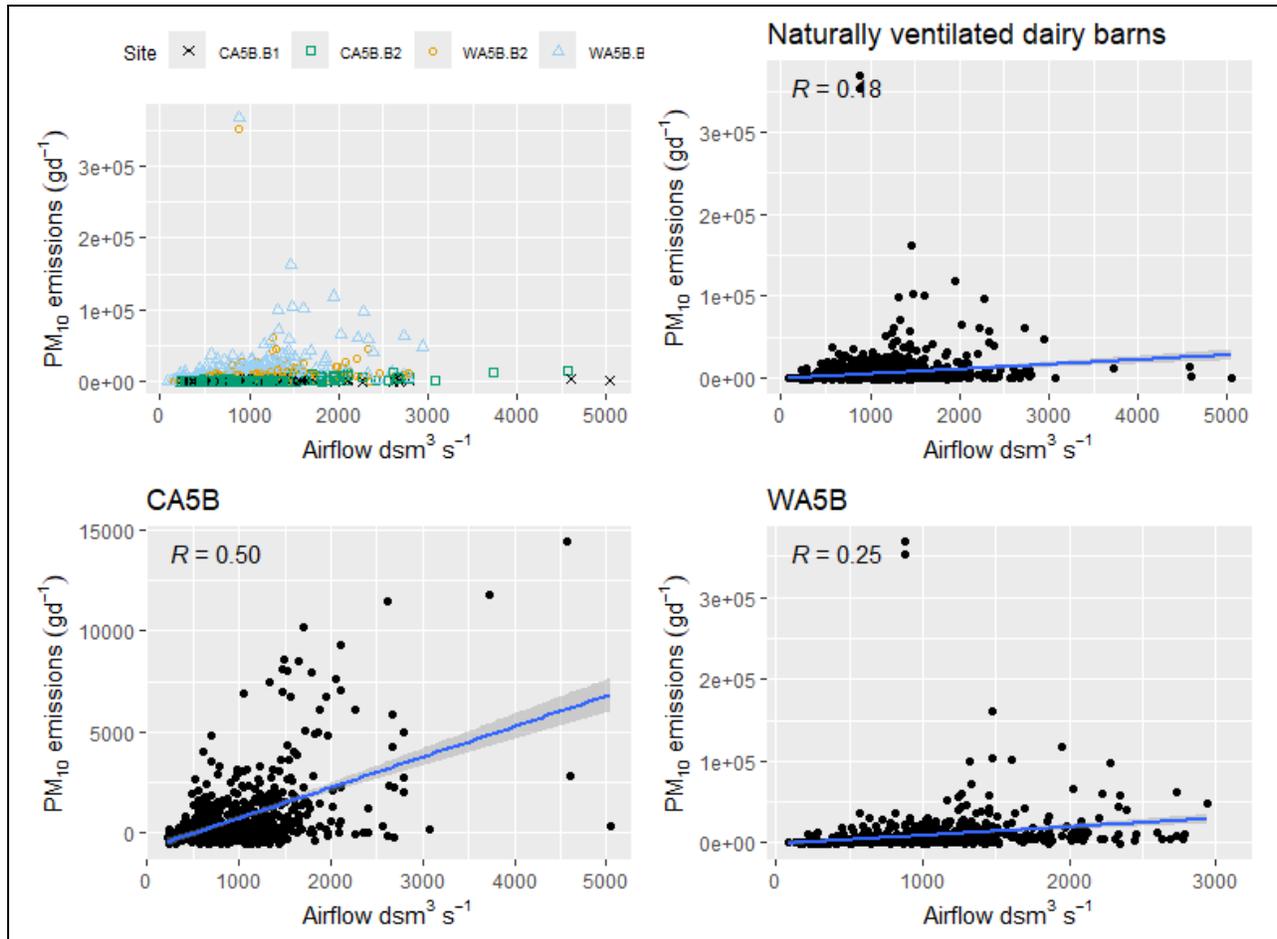


Figure 3.35: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus airflow.

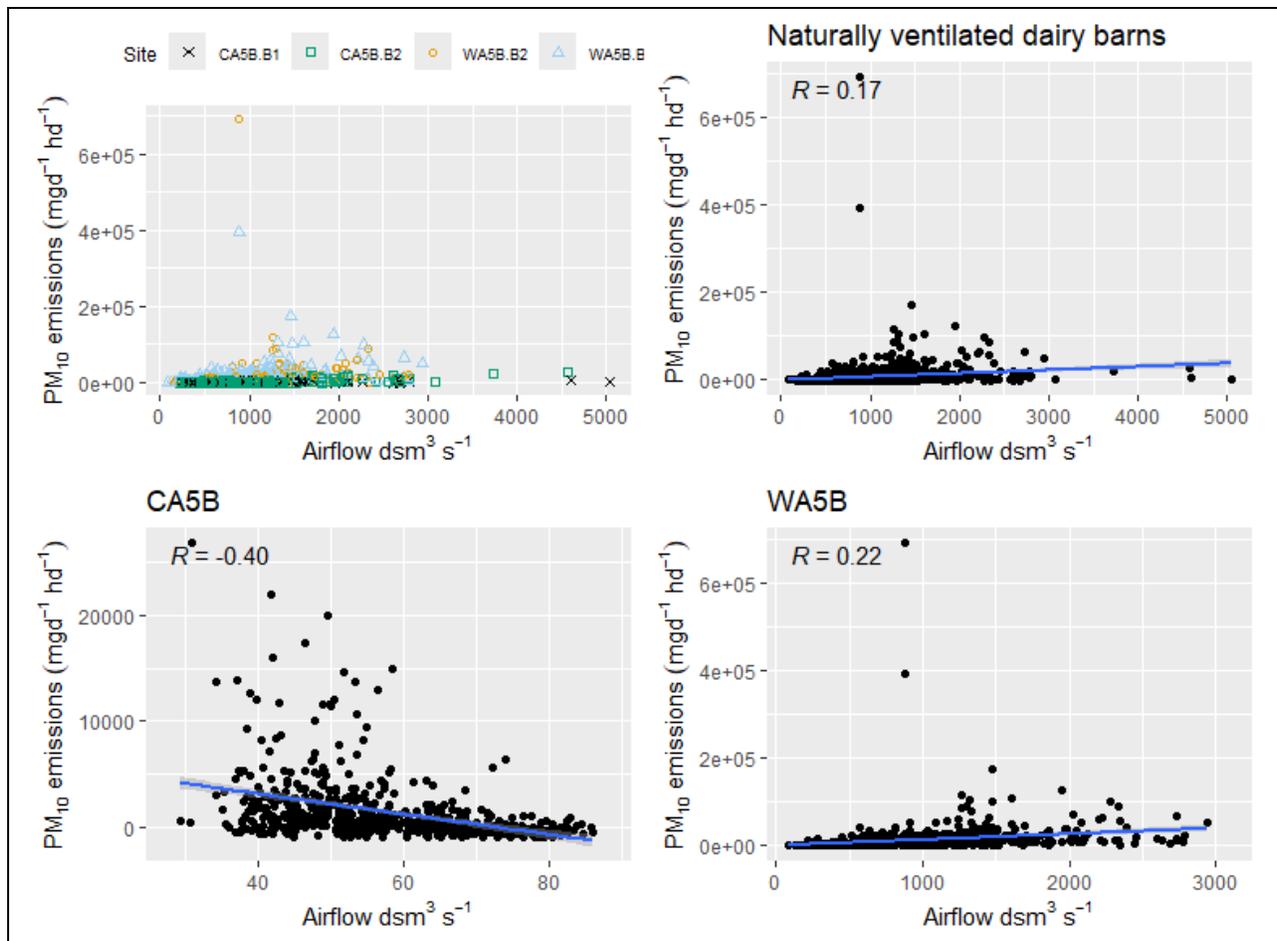


Figure 3.36: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus airflow.

3.1.3 Particulate Matter (PM_{2.5})

3.1.3.1 Inventory

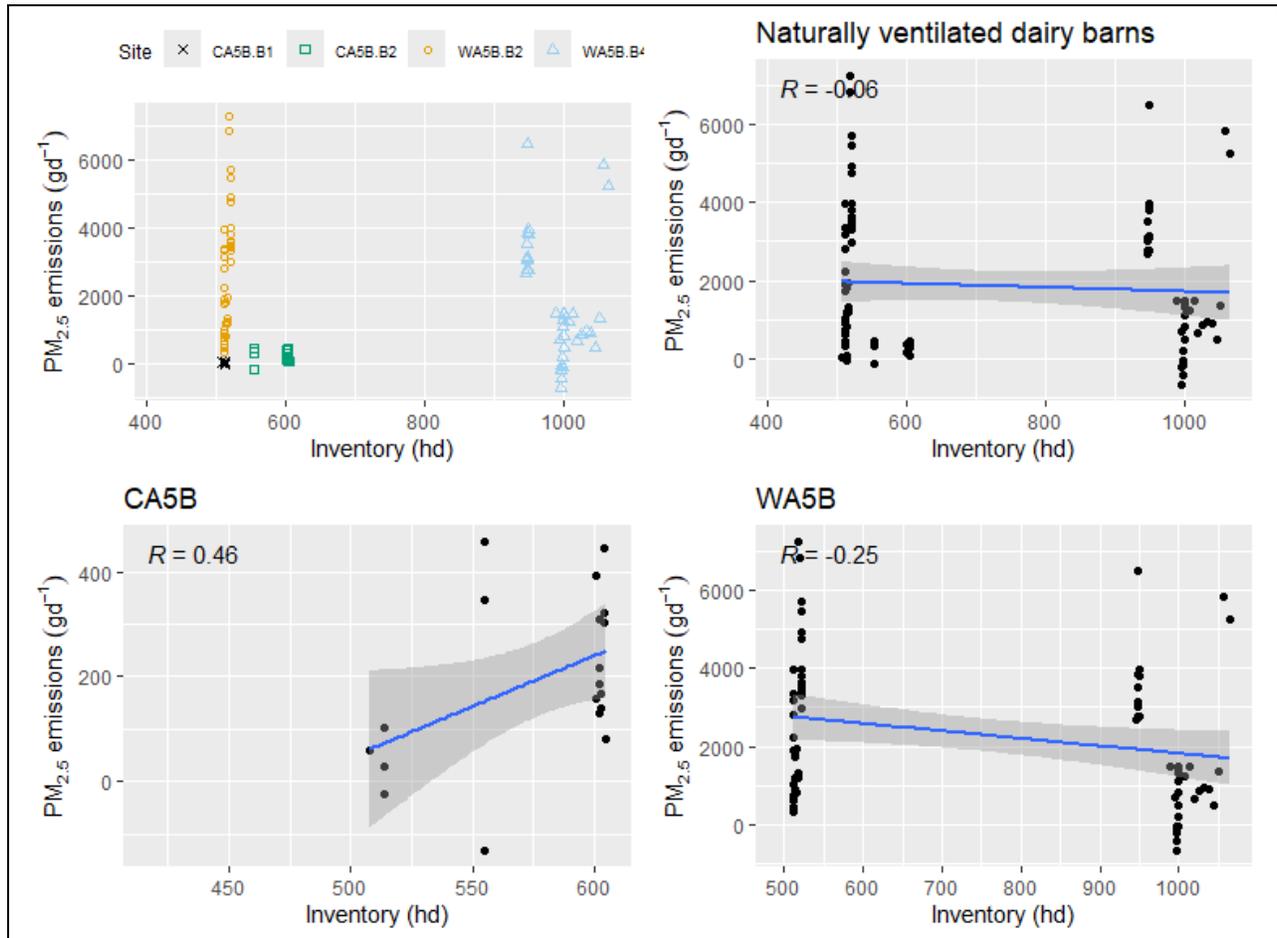


Figure 3.37: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus Inventory.

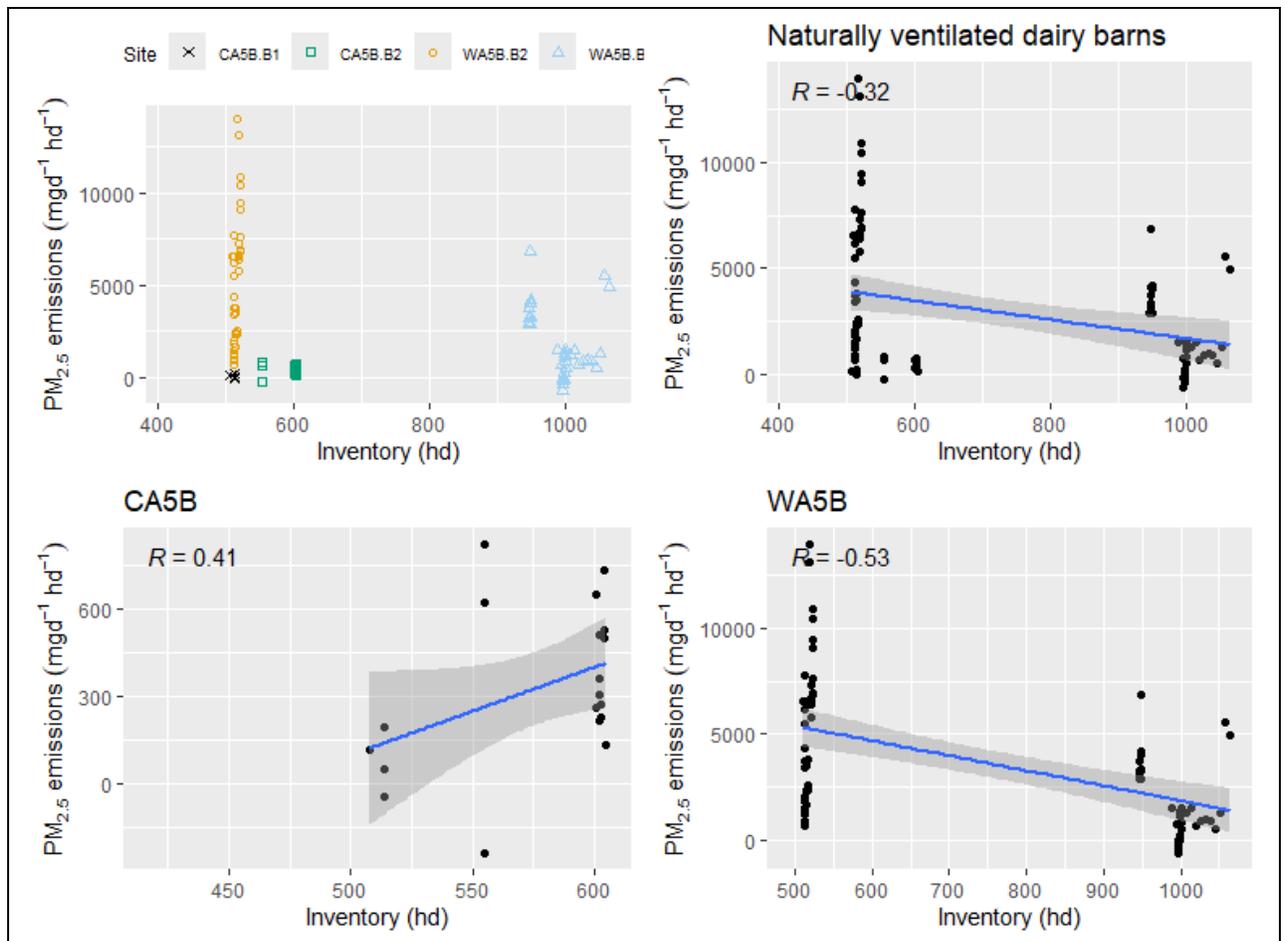


Figure 3.38: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus Inventory.

3.1.3.2 Average animal weight

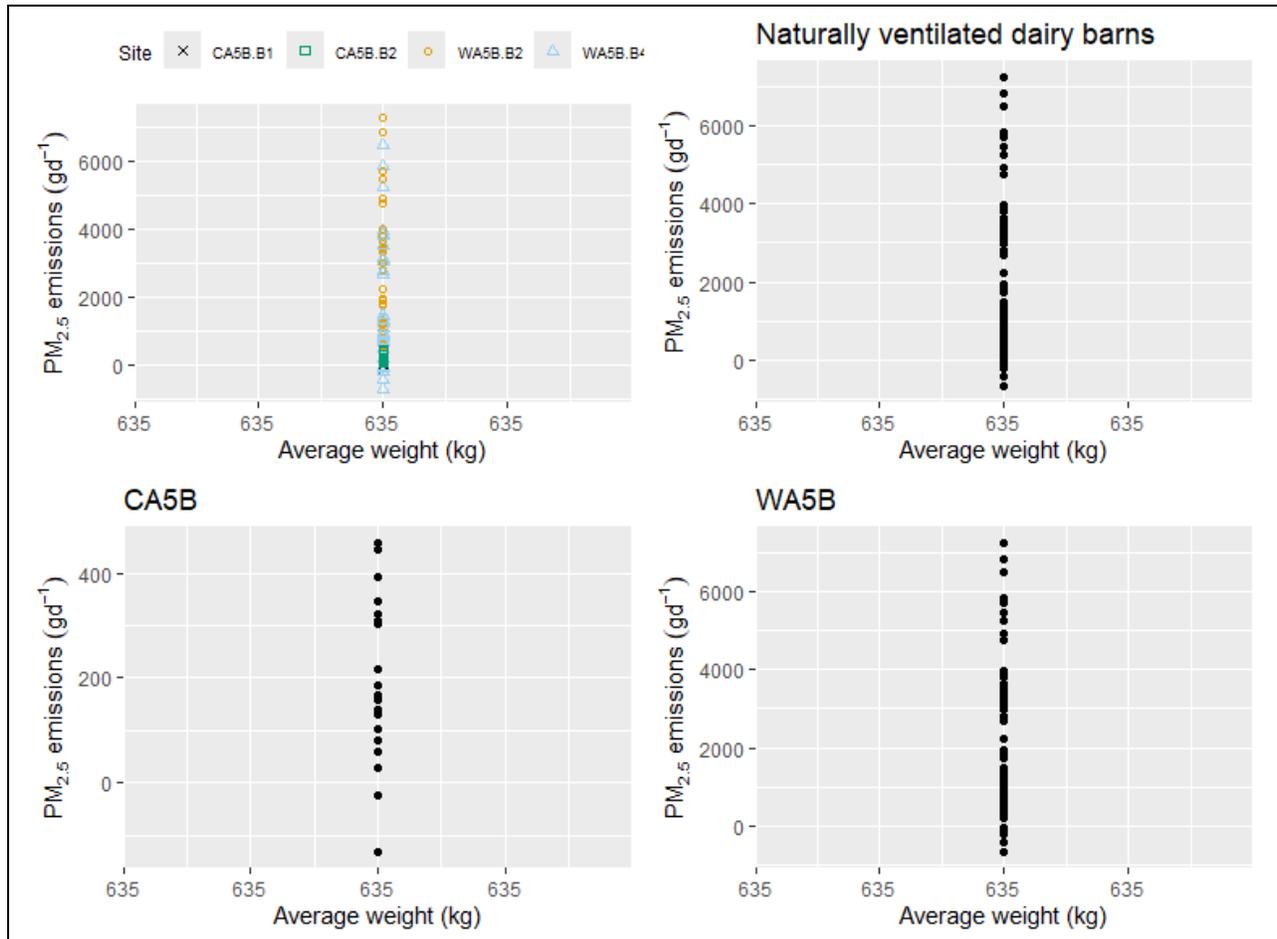


Figure 3.39: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus average animal weight.

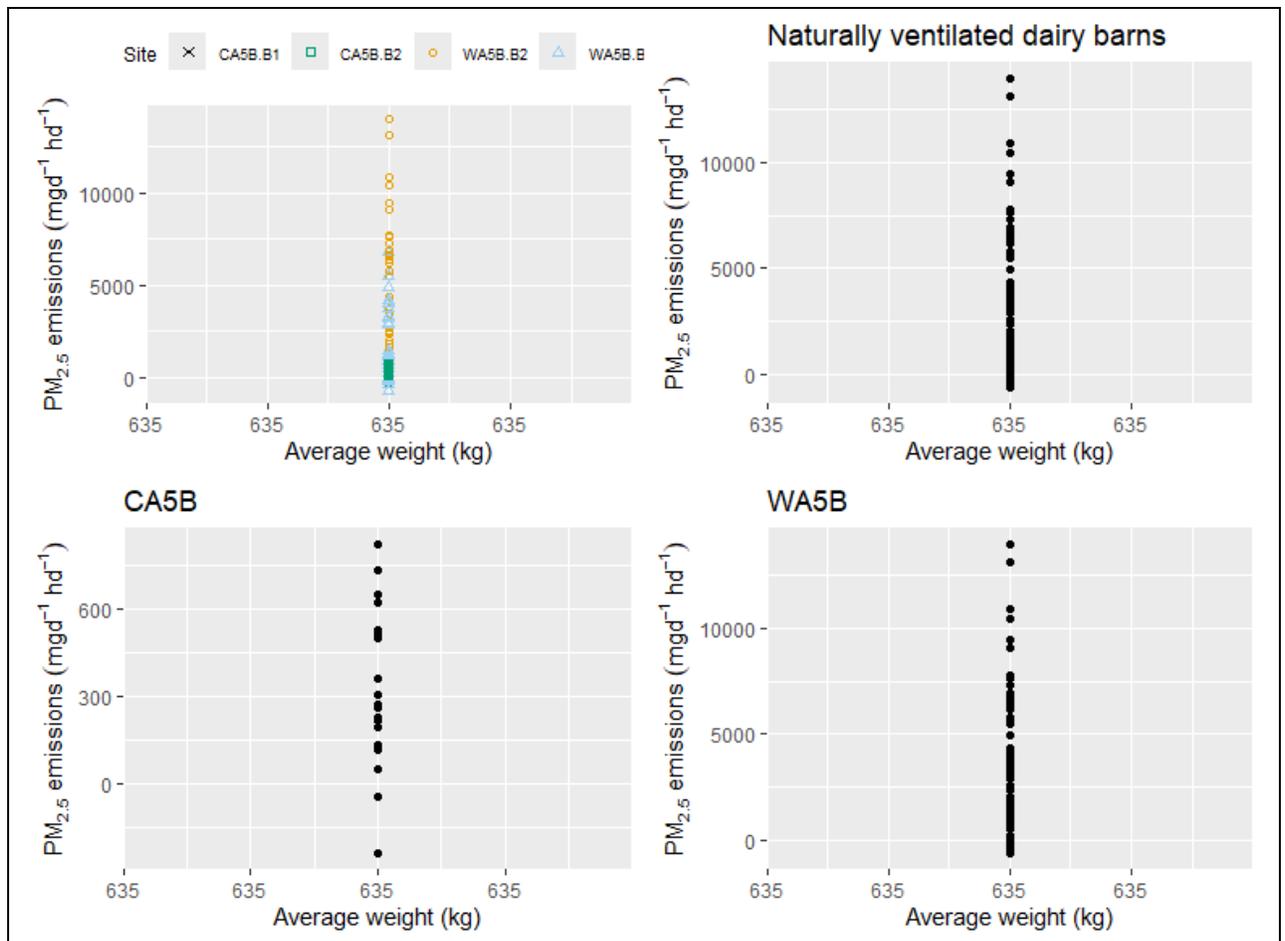


Figure 3.40: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus average animal weight.

3.1.3.3 Live animal weight

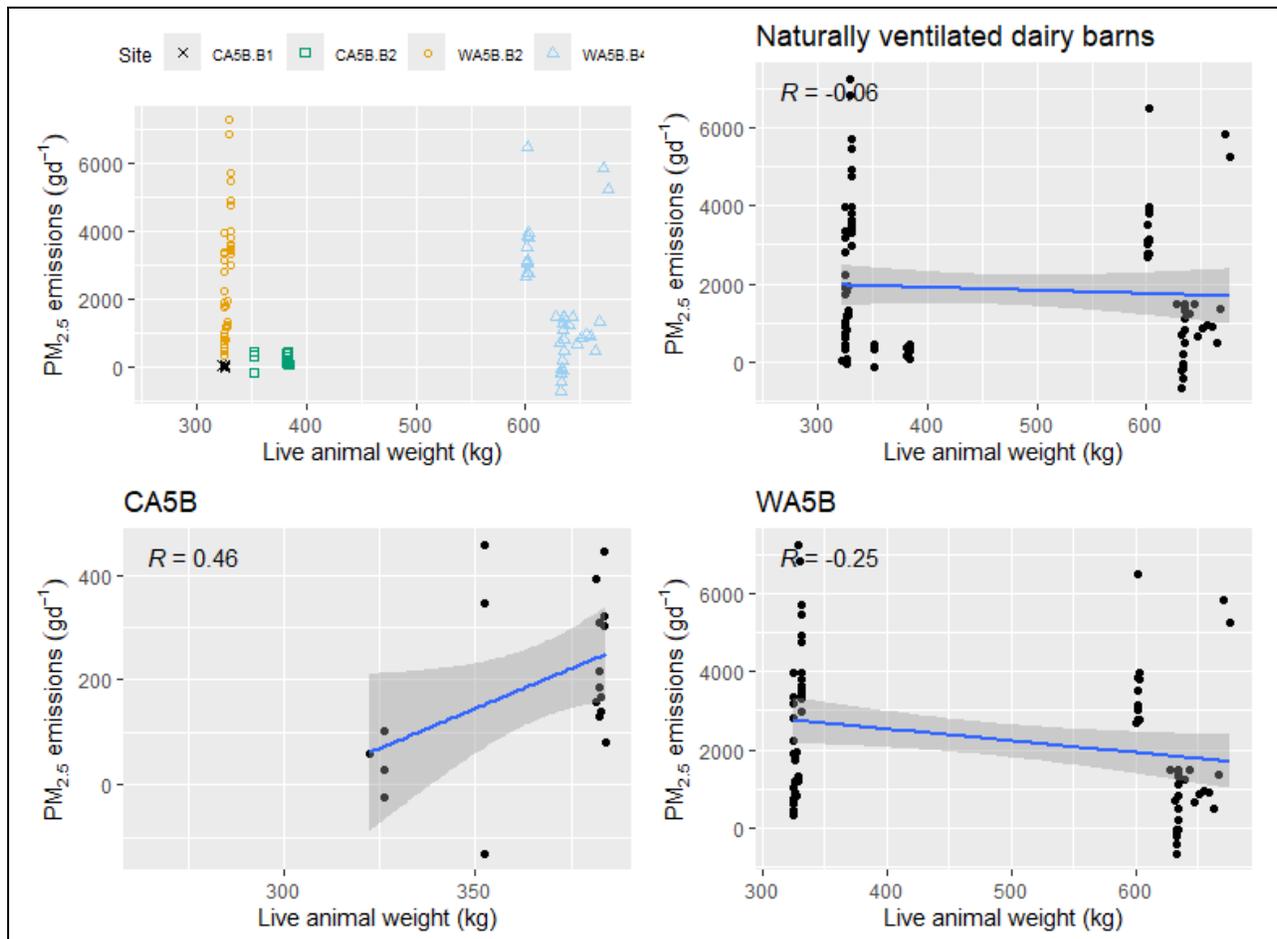


Figure 3.41: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus live animal weight.

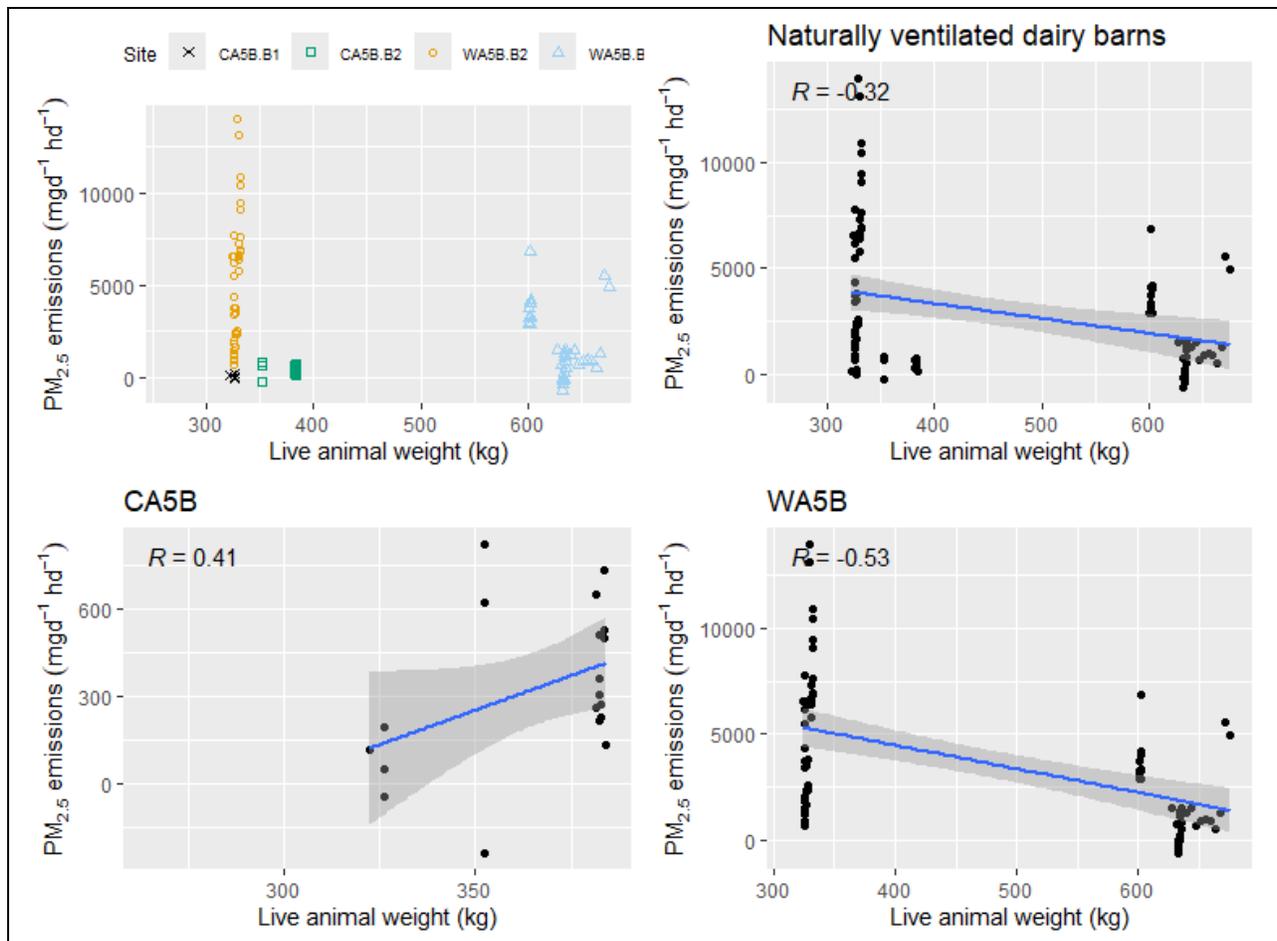


Figure 3.42: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus live animal weight.

3.1.3.4 Exhaust temperature

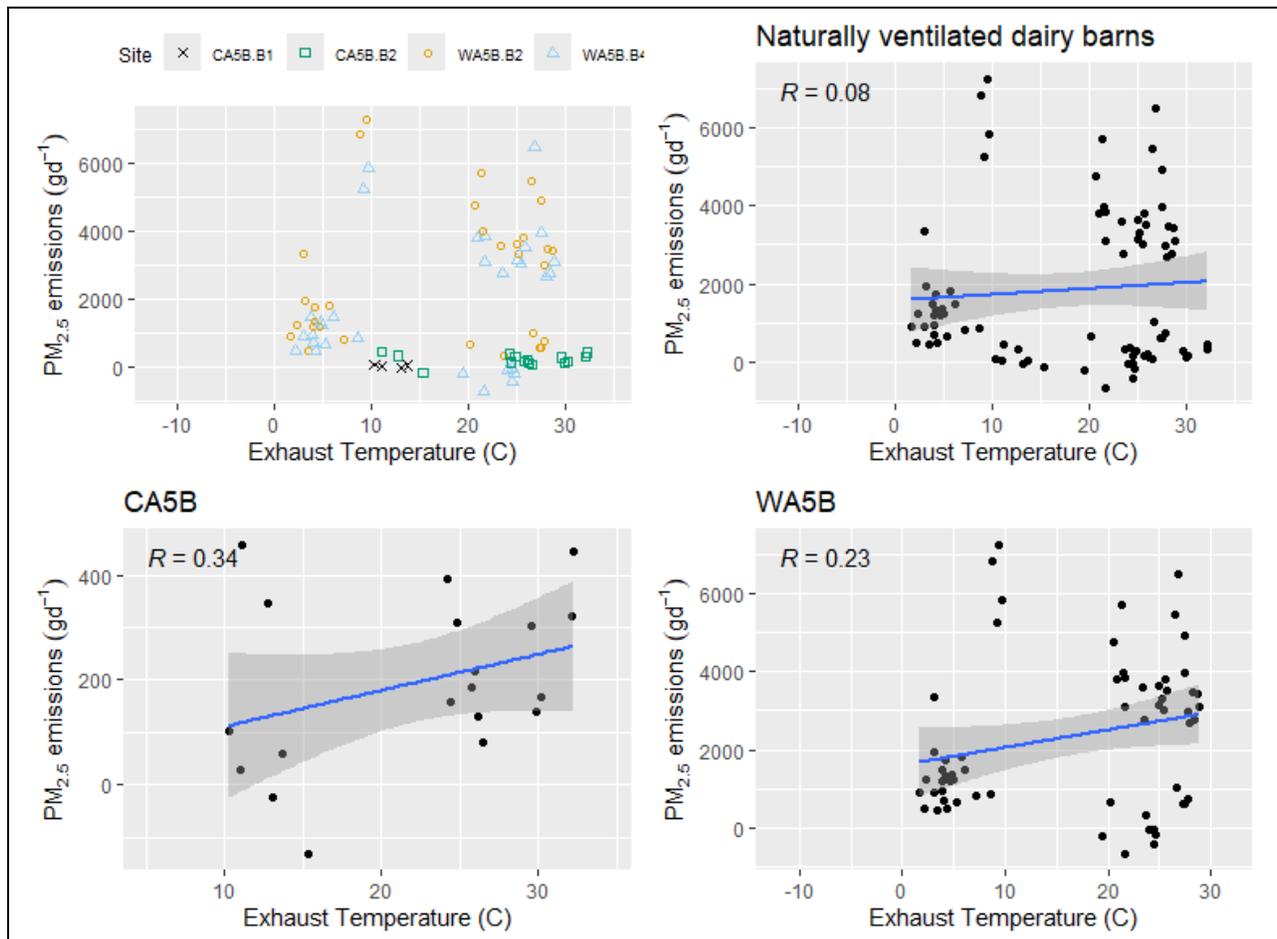


Figure 3.43: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus exhaust temperature.

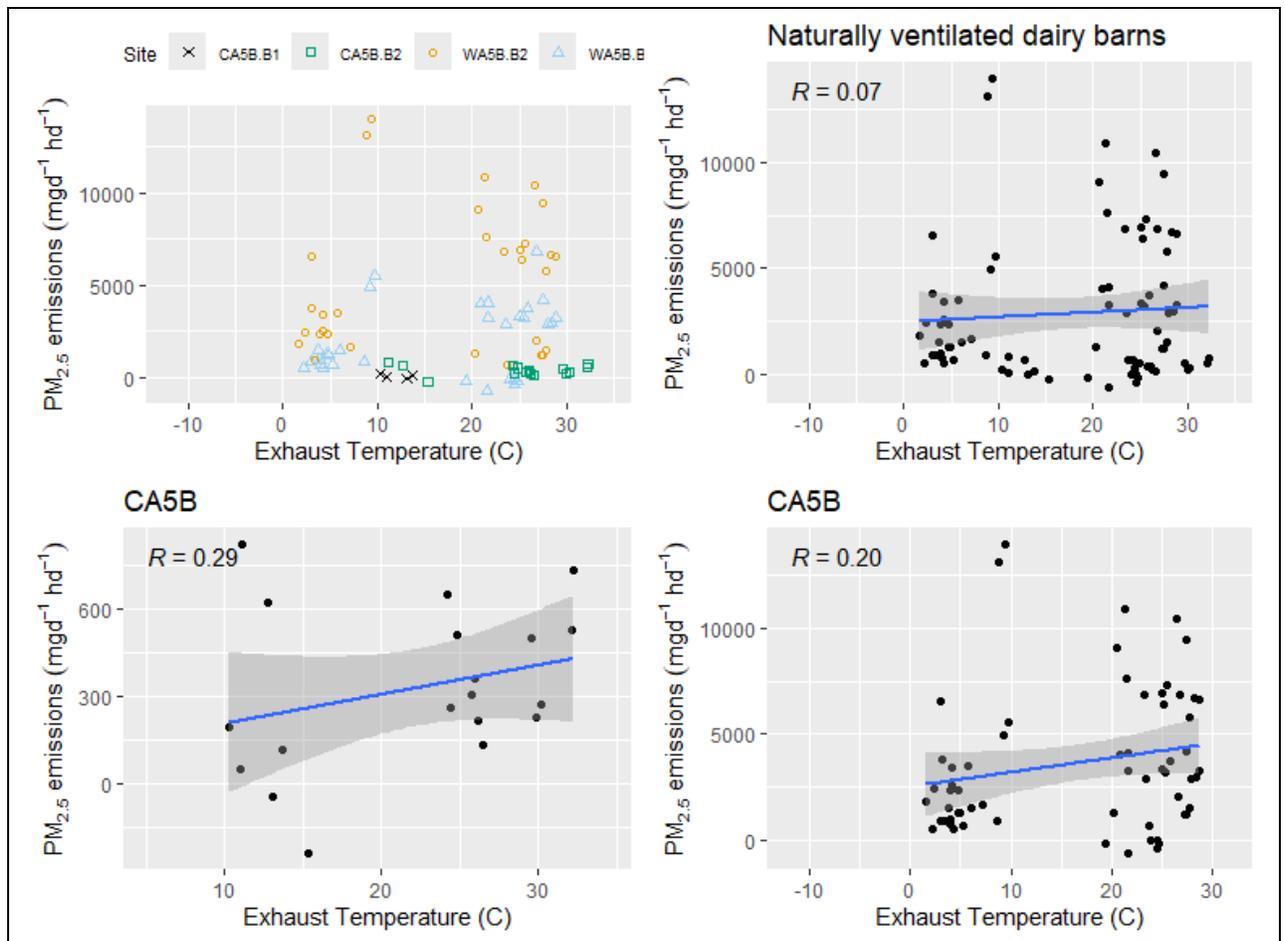


Figure 3.44: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus exhaust temperature.

3.1.3.5 Exhaust relative humidity

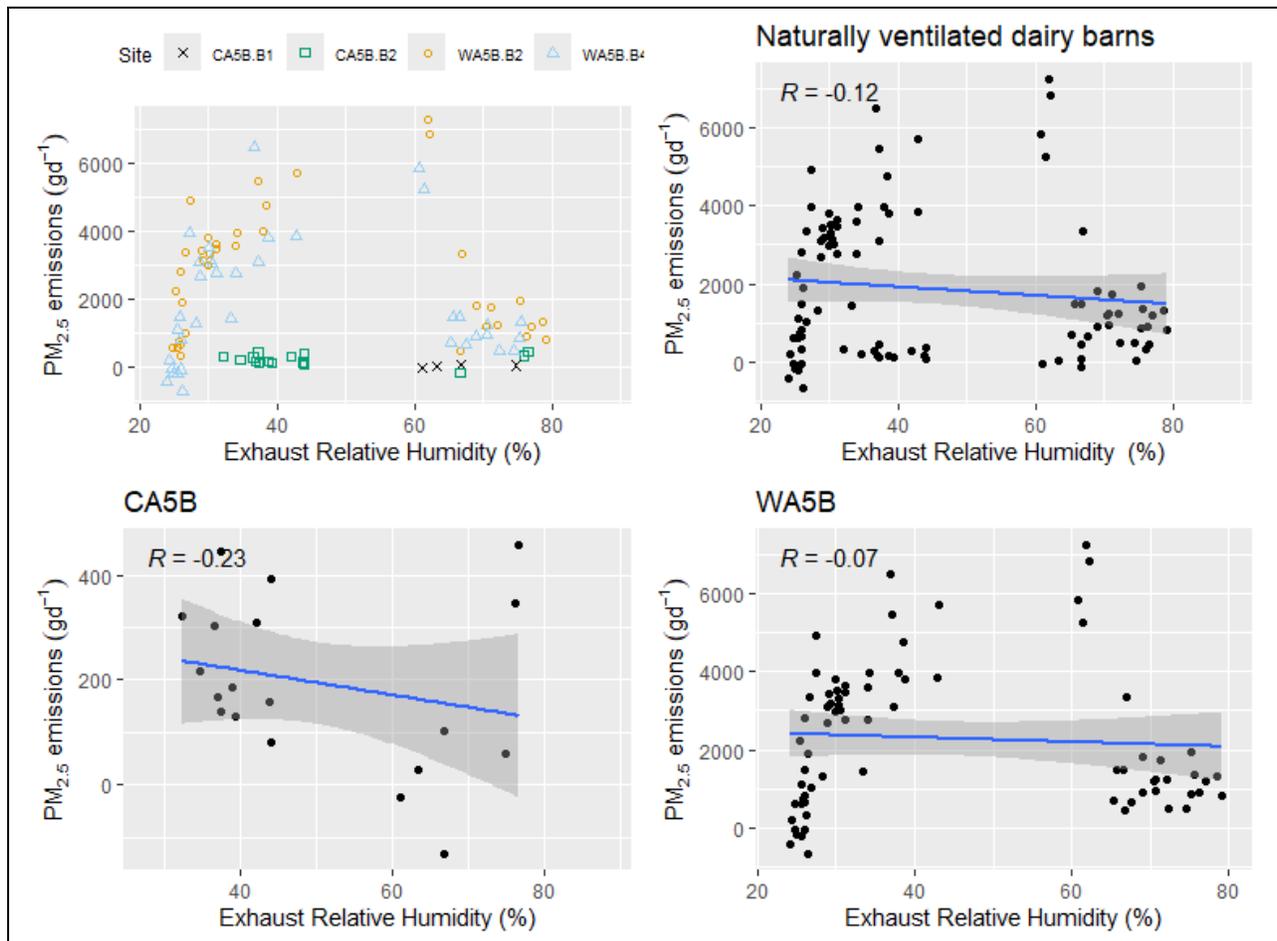


Figure 3.45: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus exhaust relative humidity.

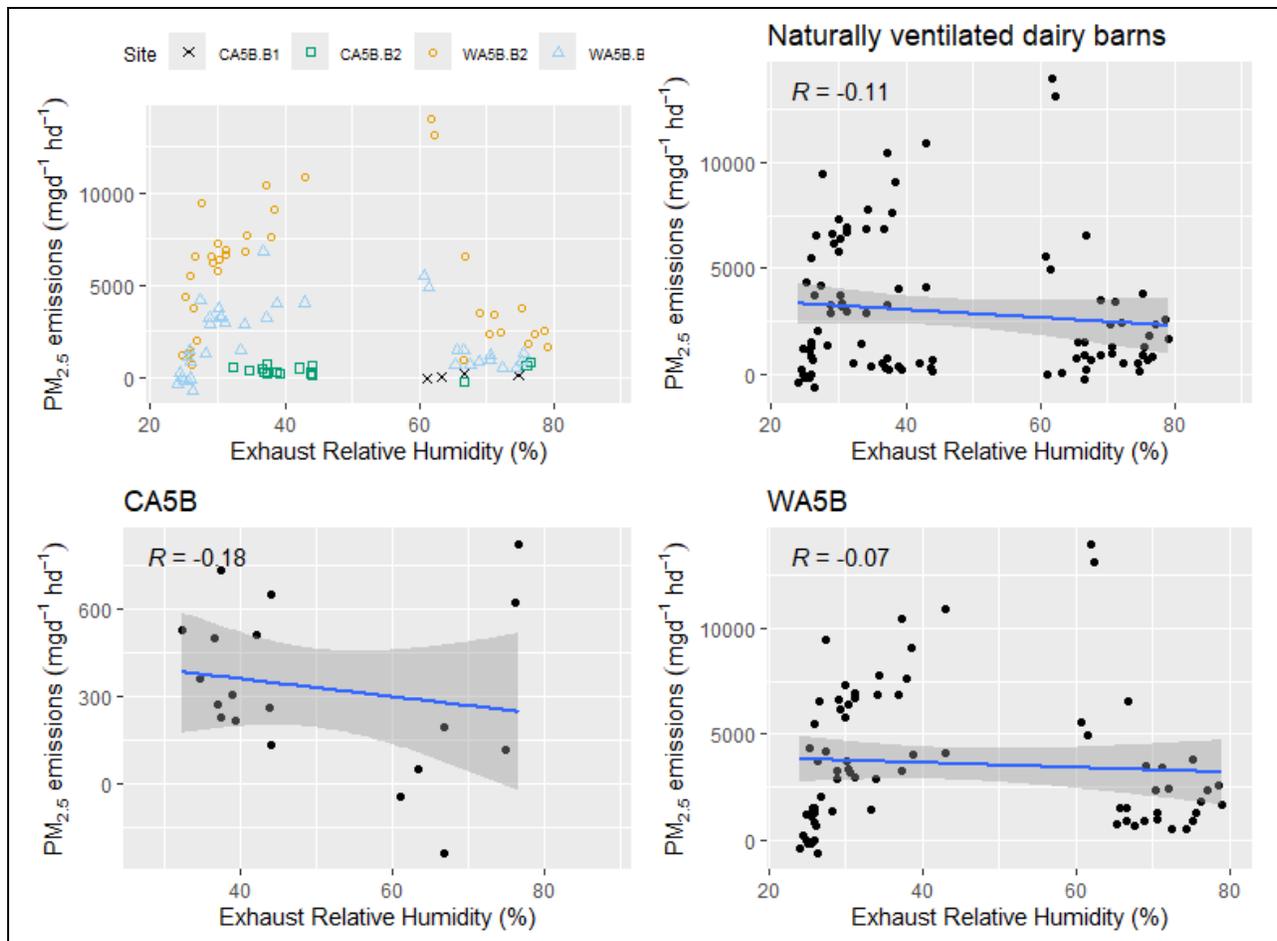


Figure 3.46: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus exhaust relative humidity.

3.1.3.6 Airflow

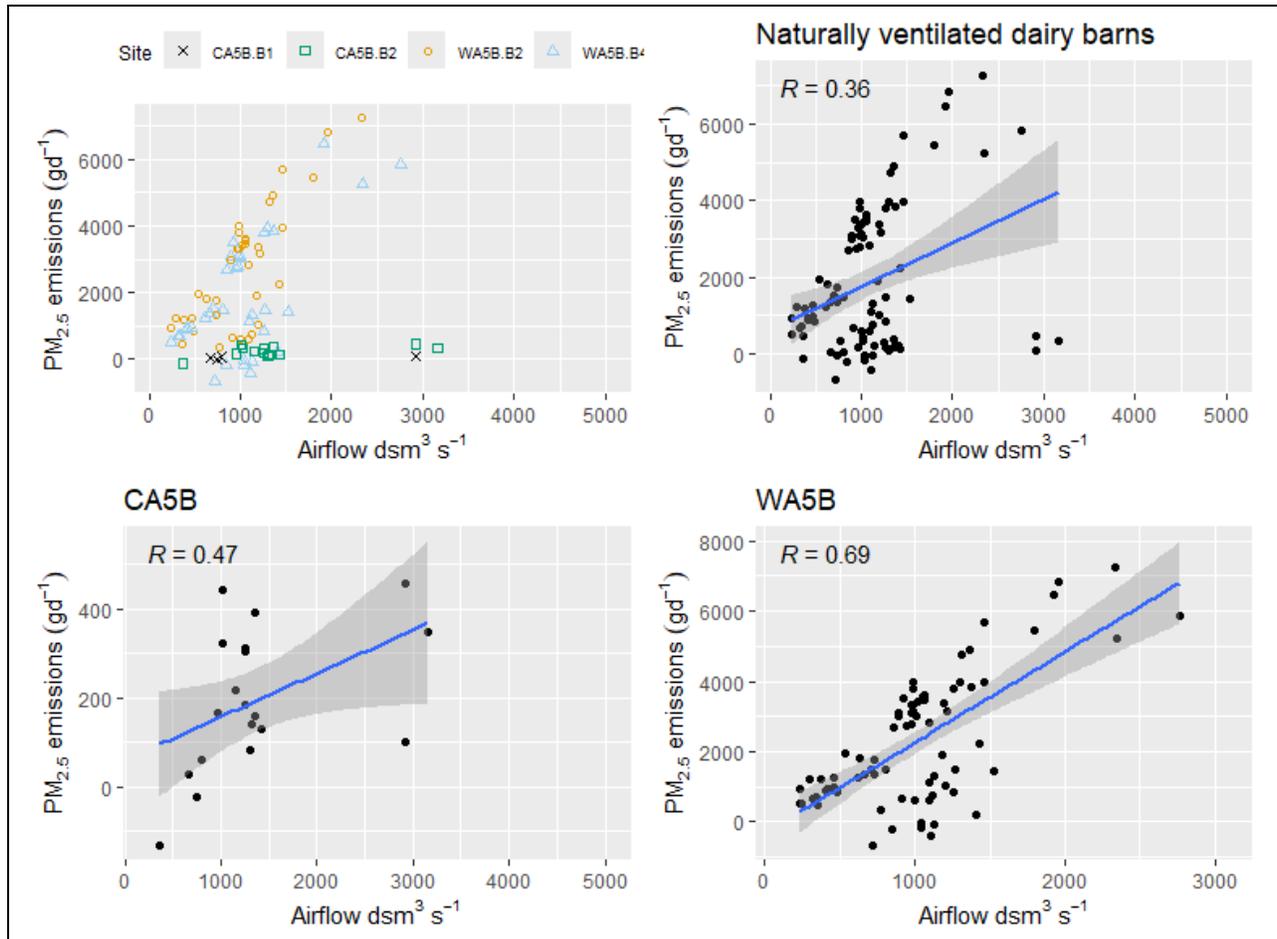


Figure 3.47: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus airflow.

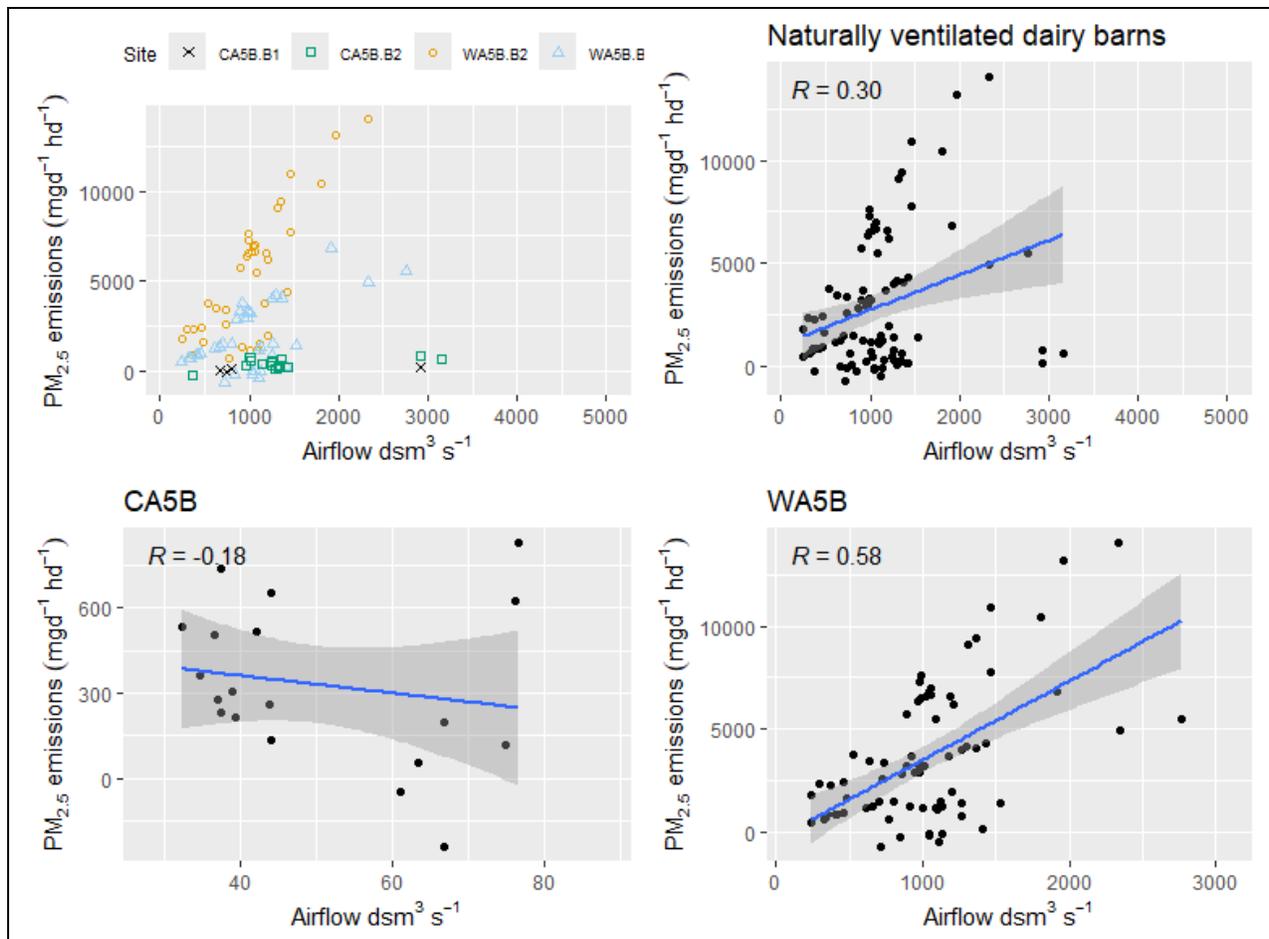


Figure 3.48: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus airflow.

3.1.4 Total Suspended Particulates (TSP)

3.1.4.1 Inventory

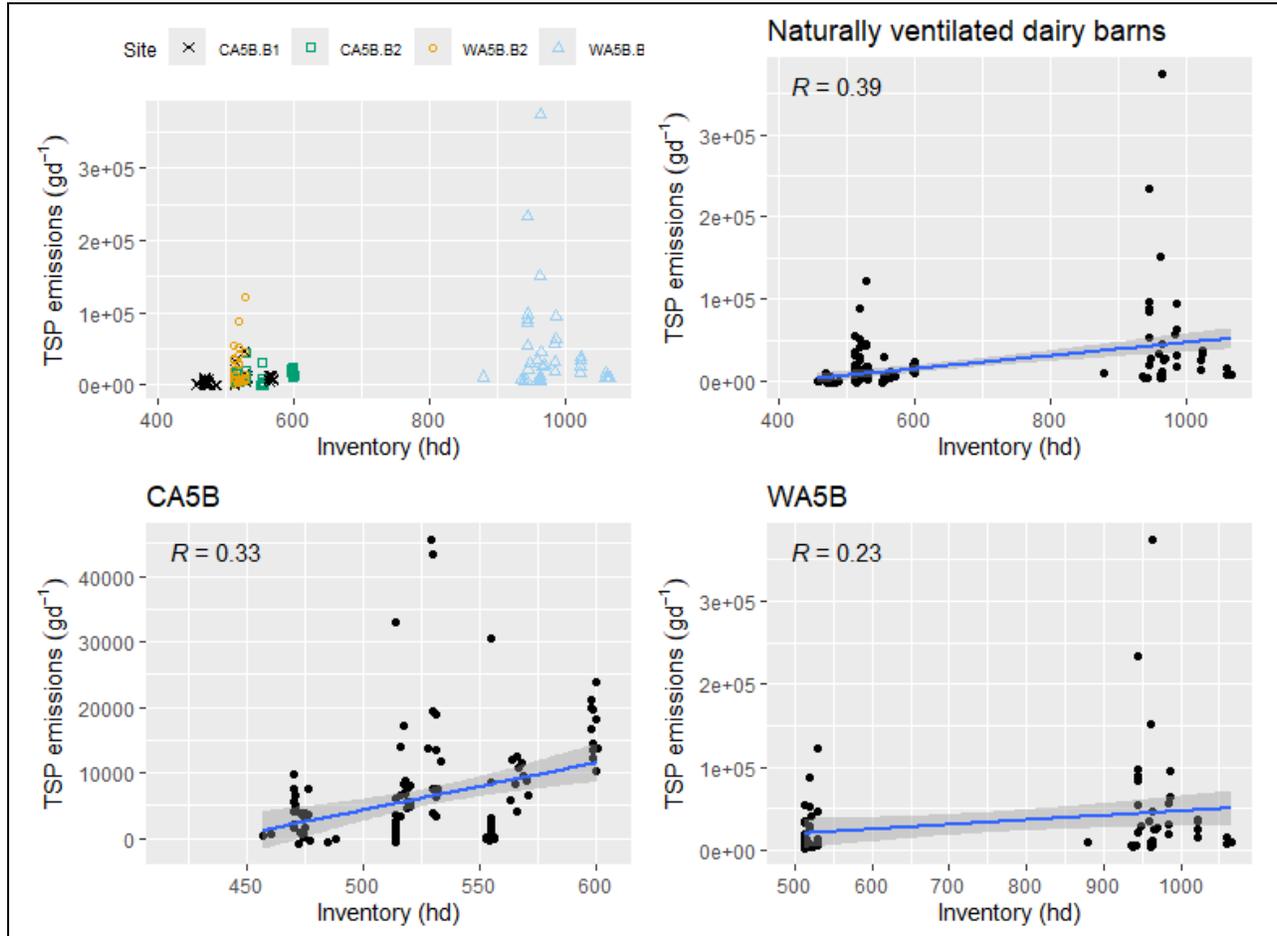


Figure 3.49: Scatter plot of naturally ventilated dairy barns TSP emissions (g d^{-1}) versus Inventory.

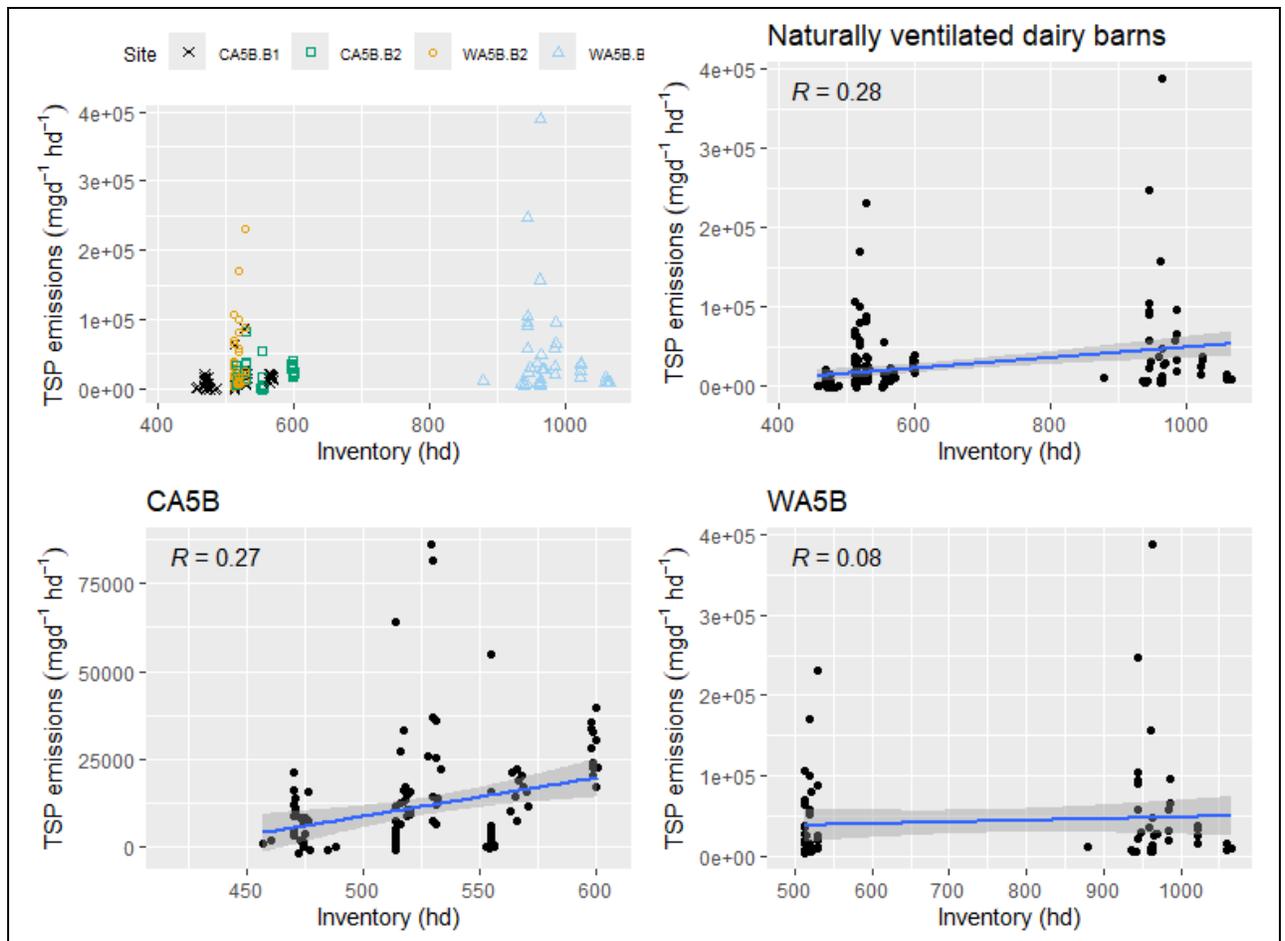


Figure 3.50: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus Inventory.

3.1.4.2 Average animal weight

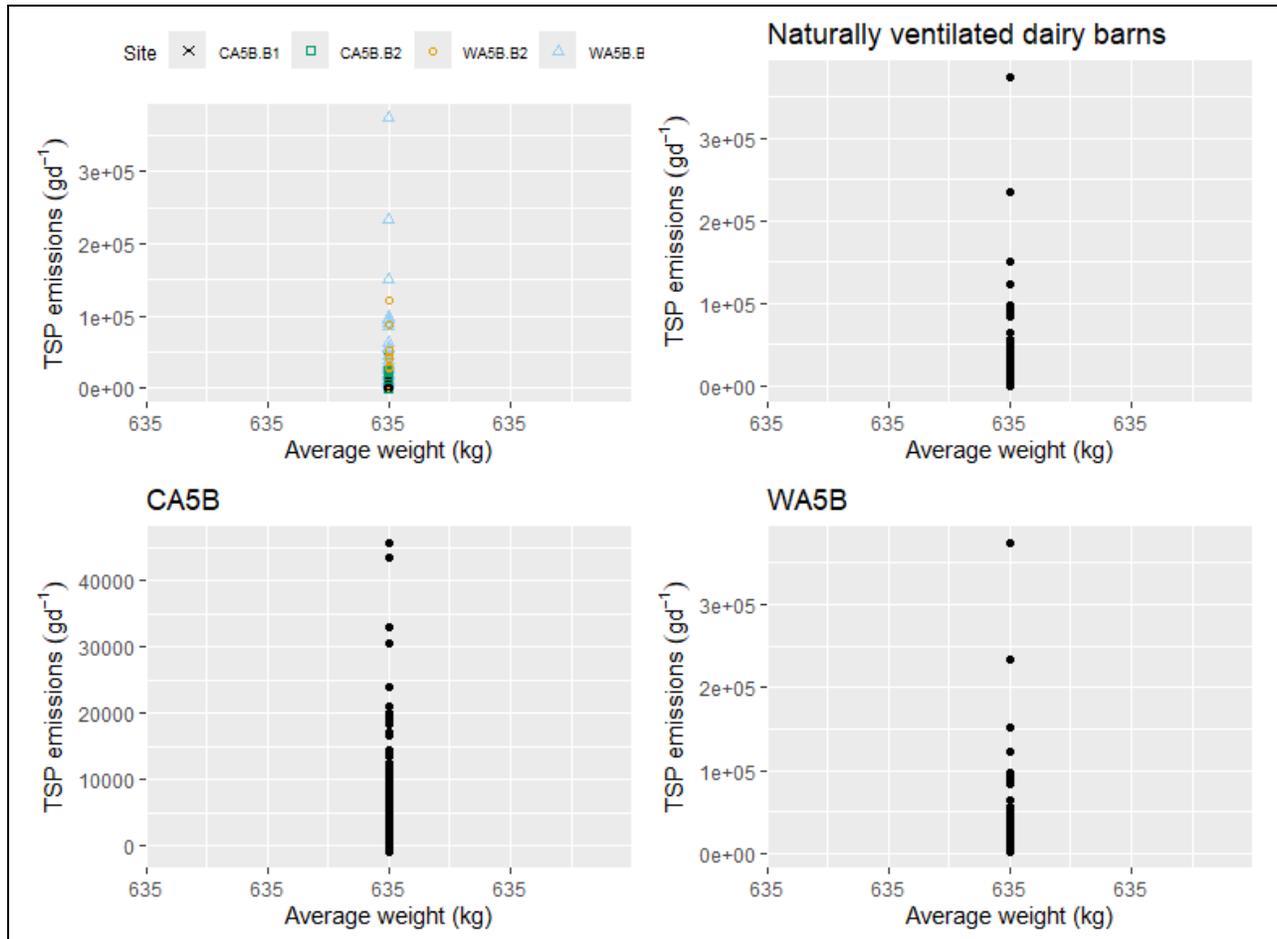


Figure 3.51: Scatter plot of naturally ventilated dairy barns TSP emissions (g d^{-1}) versus average animal weight.

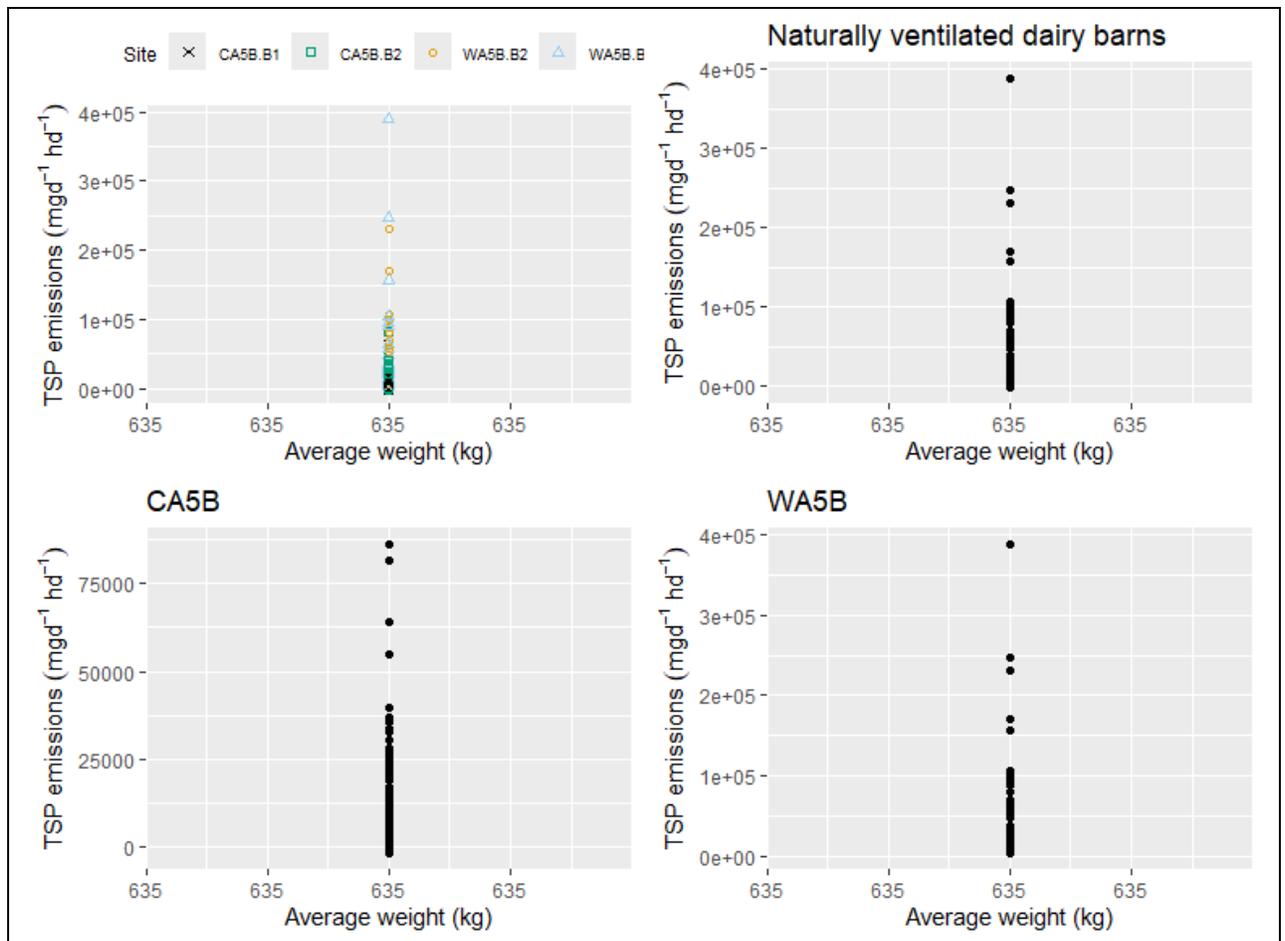


Figure 3.52: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus average animal weight.

3.1.4.3 Live animal weight

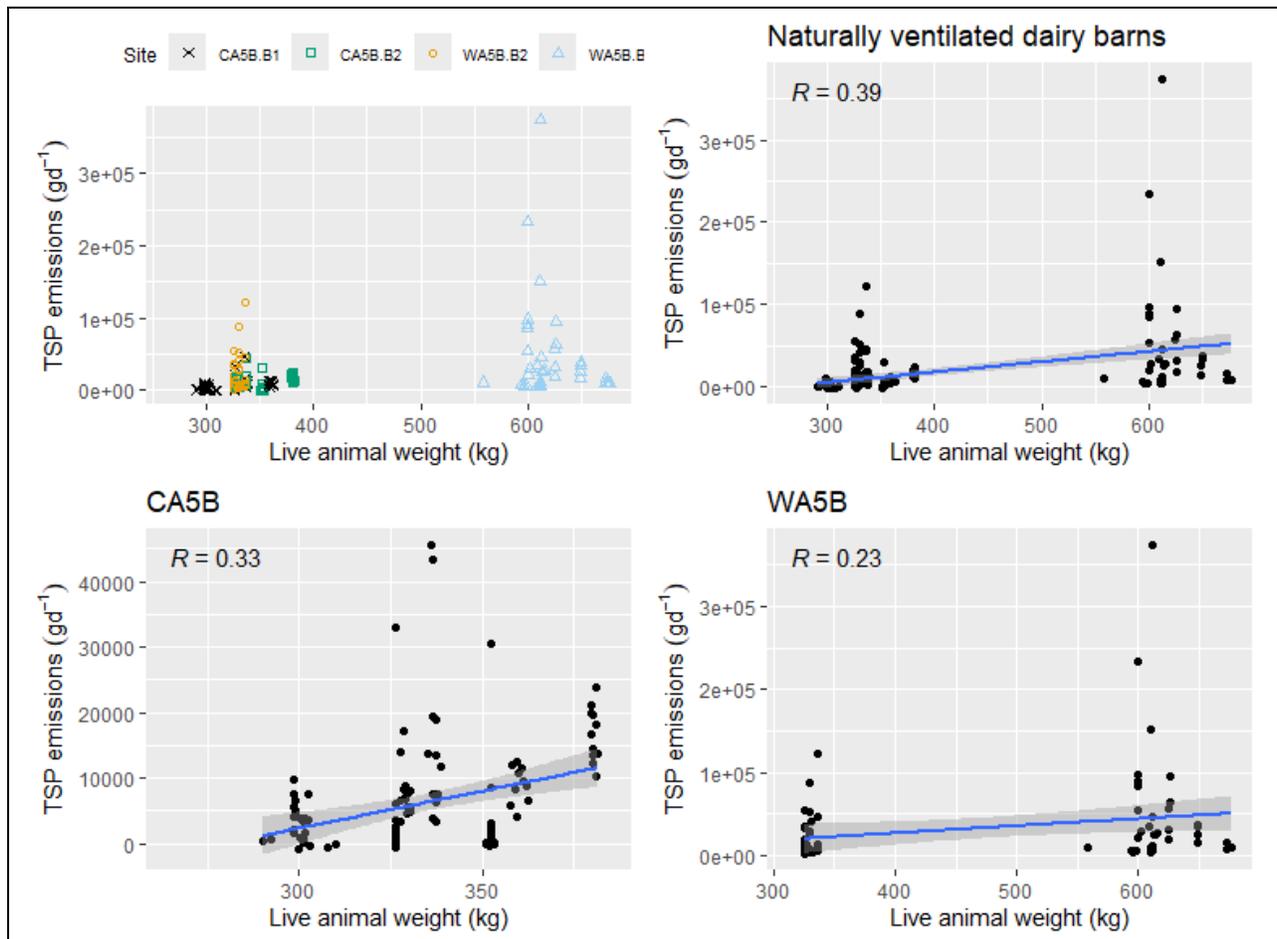


Figure 3.53: Scatter plot of naturally ventilated dairy barns TSP emissions (g d^{-1}) versus live animal weight.

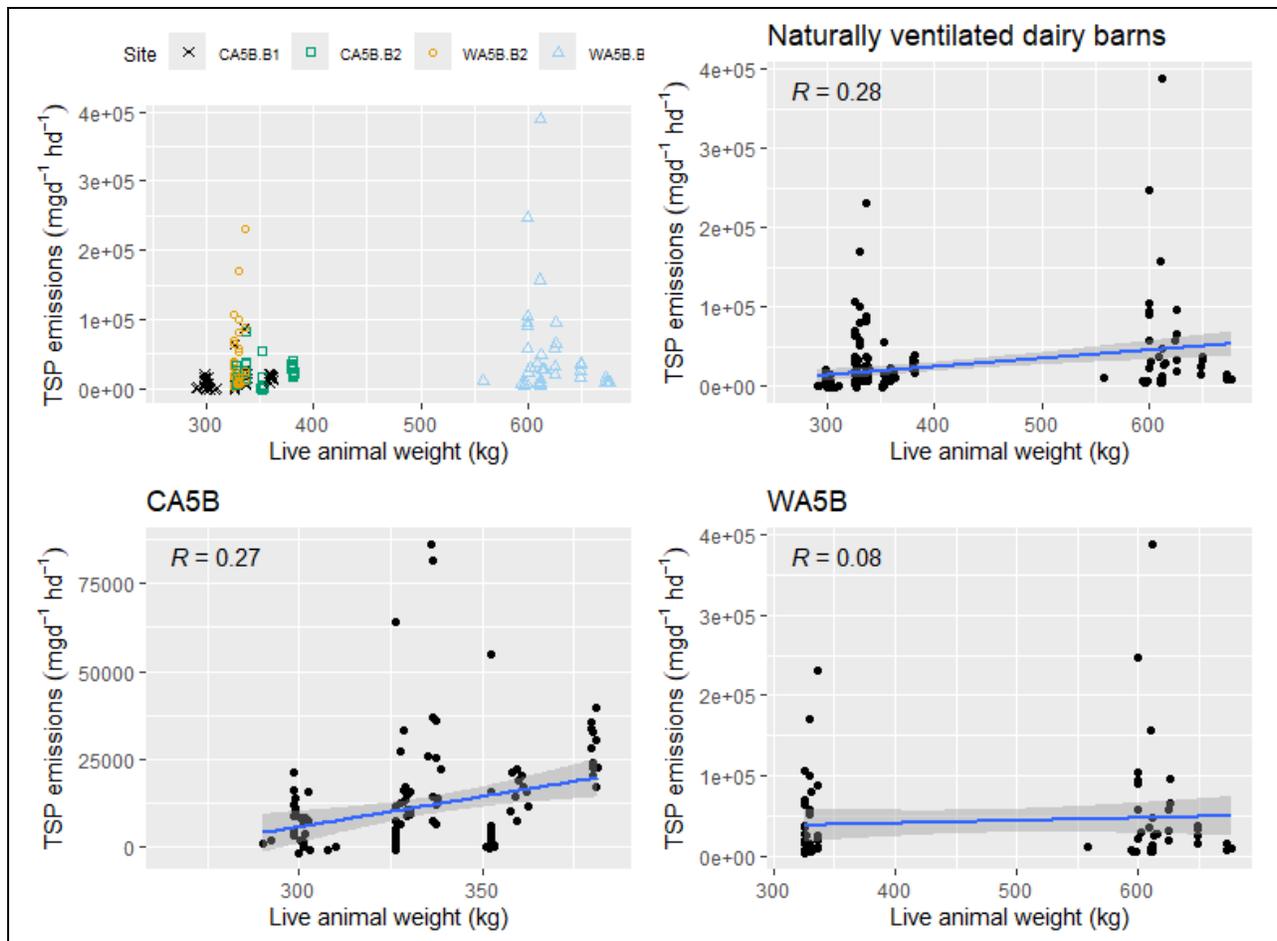


Figure 3.54: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus live animal weight.

3.1.4.4 Exhaust temperature

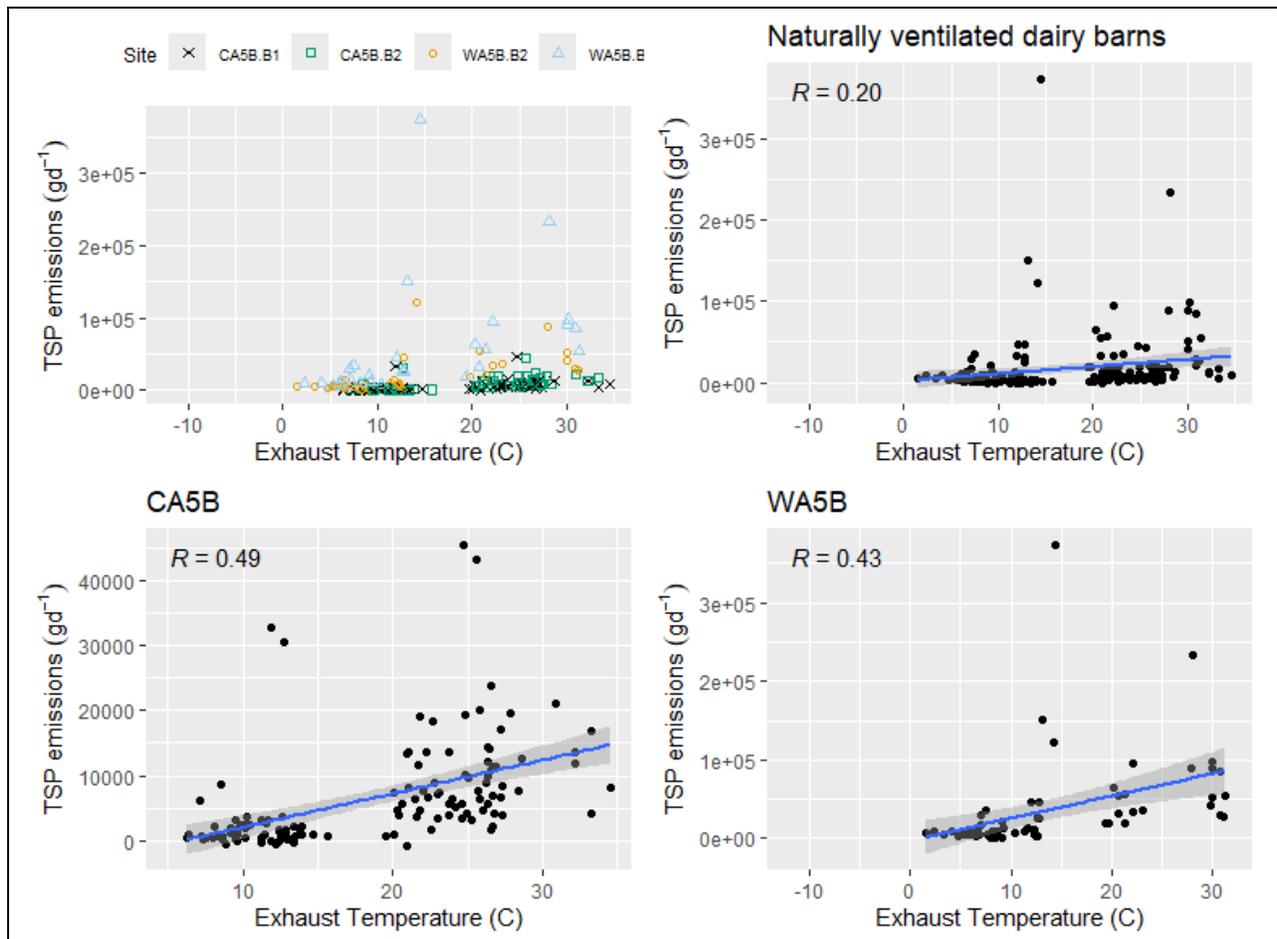


Figure 3.55: Scatter plot of naturally ventilated dairy barns TSP emissions (g d⁻¹) versus exhaust temperature.

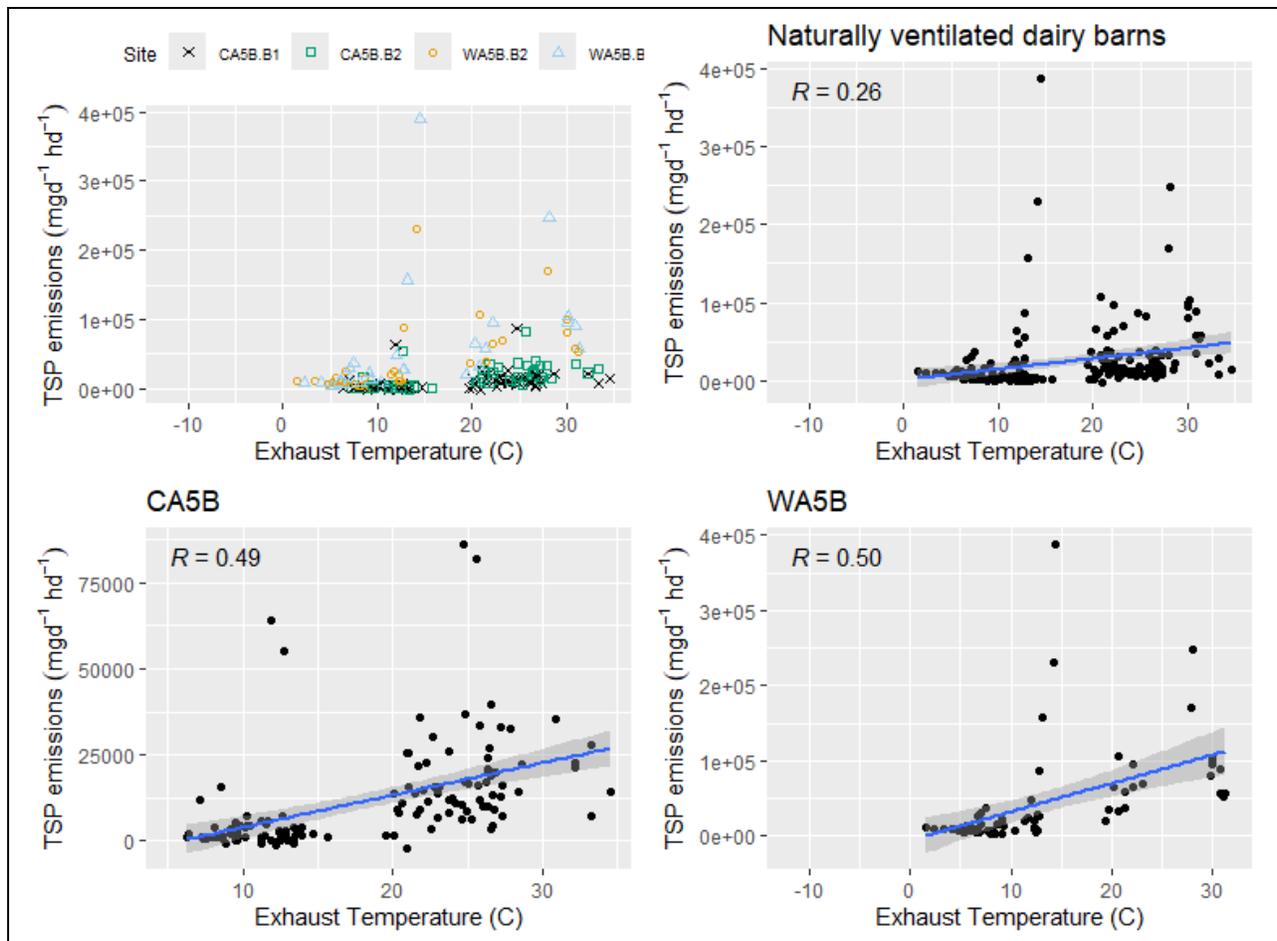


Figure 3.56: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus exhaust temperature.

3.1.4.5 Exhaust relative humidity

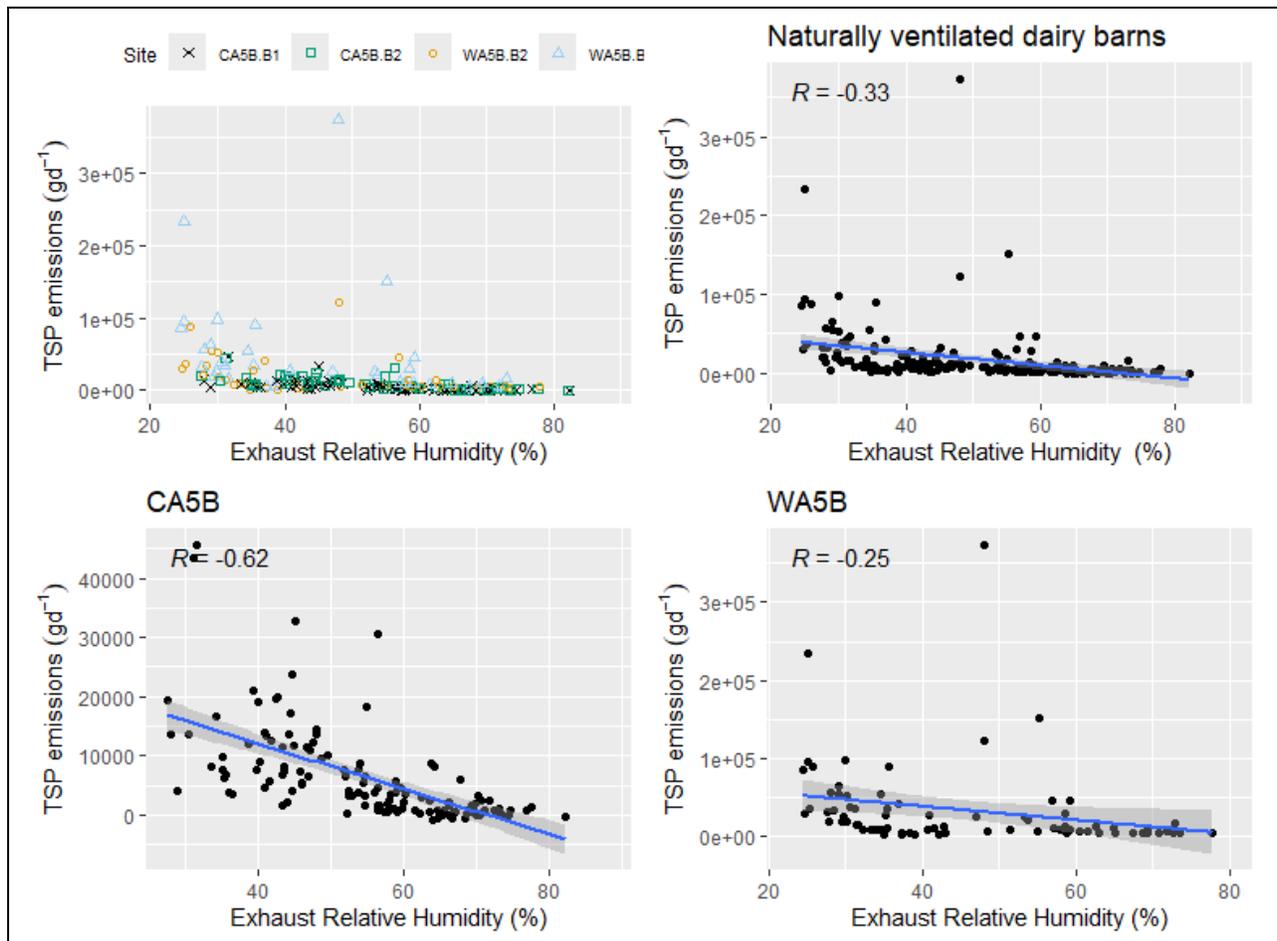


Figure 3.57: Scatter plot of naturally ventilated dairy barns TSP emissions (g d^{-1}) versus exhaust relative humidity.

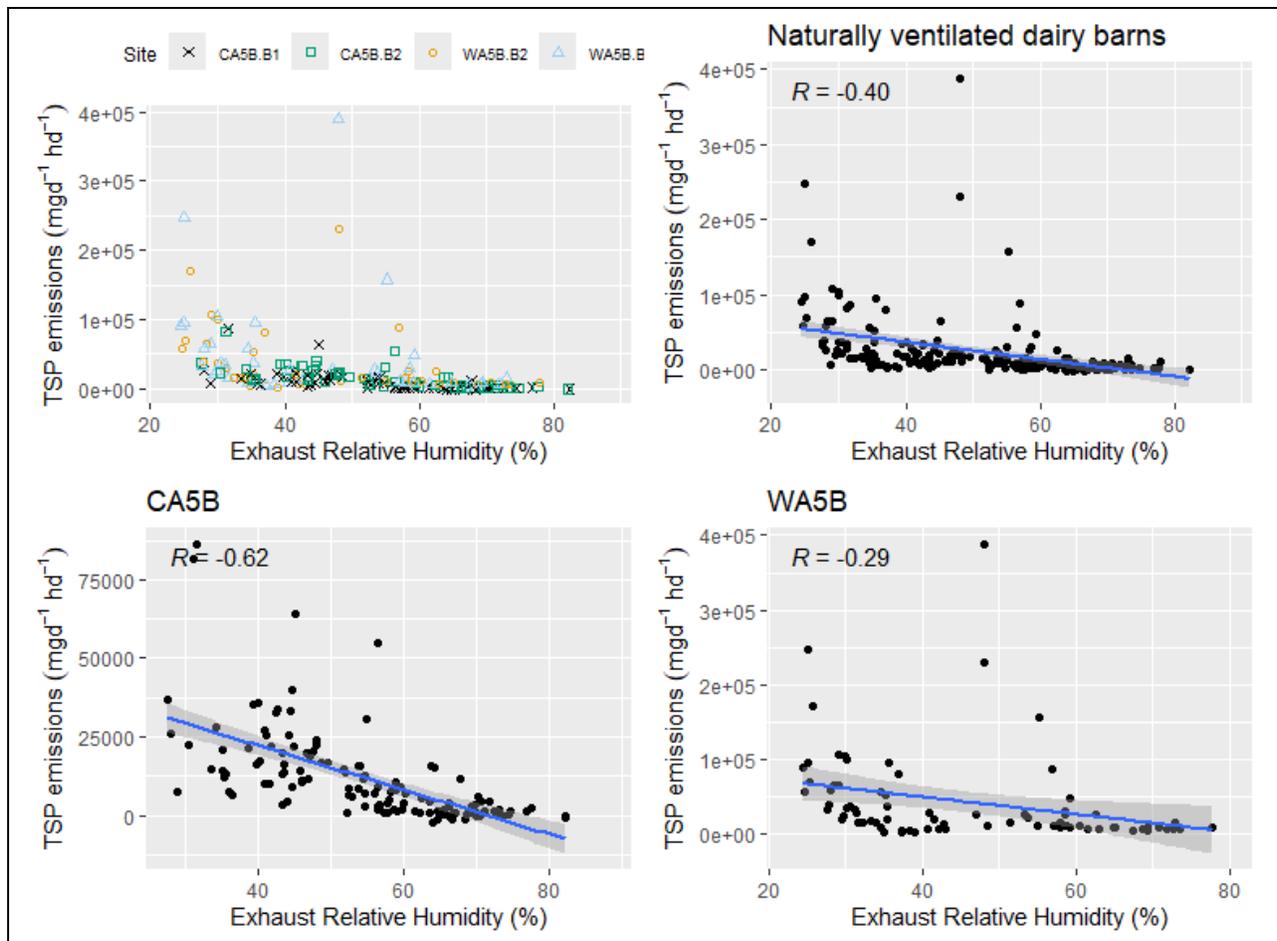


Figure 3.58: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus exhaust relative humidity.

3.1.4.6 Airflow

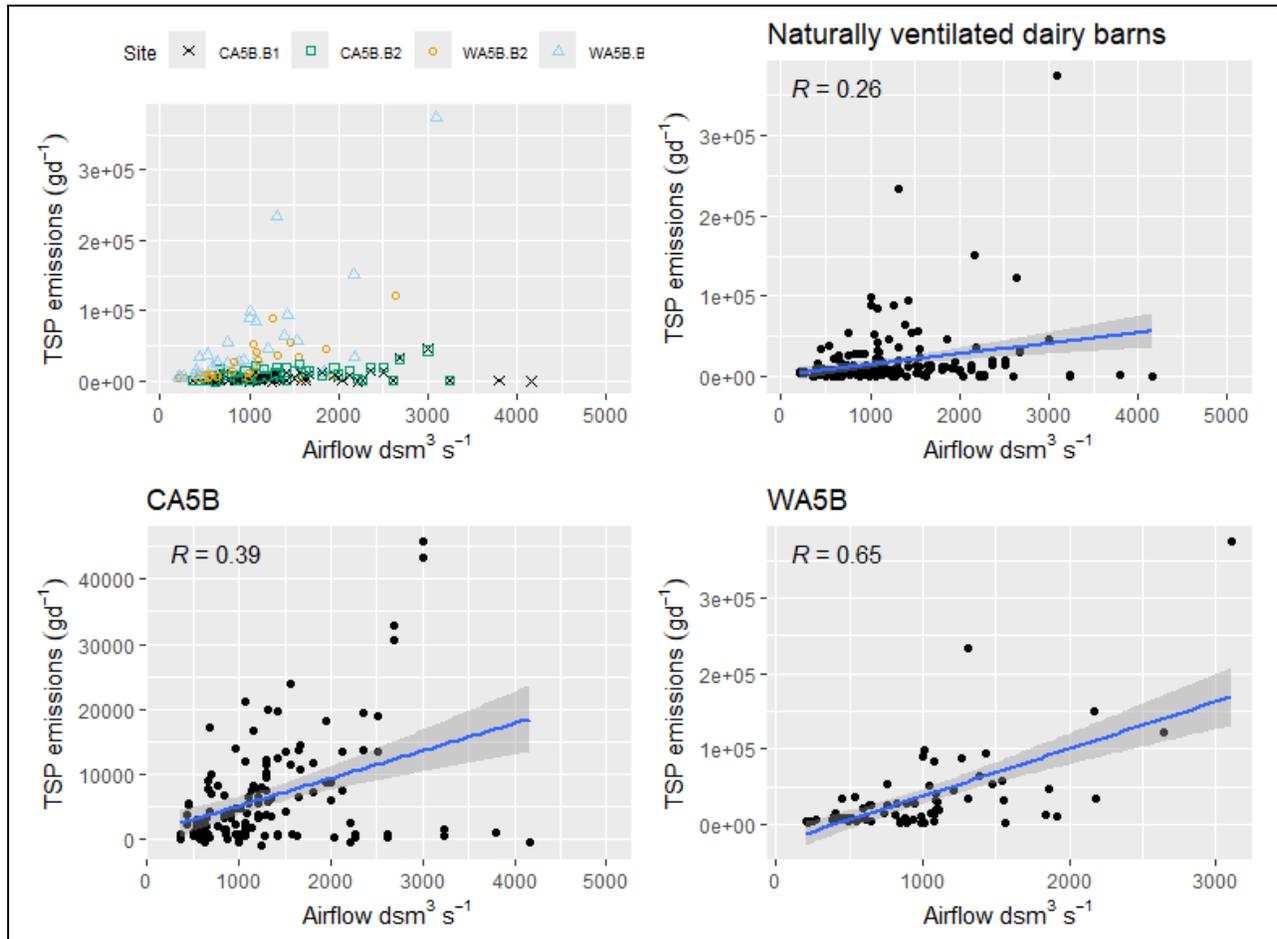


Figure 3.59: Scatter plot of naturally ventilated dairy barns TSP emissions (g d⁻¹) versus airflow.

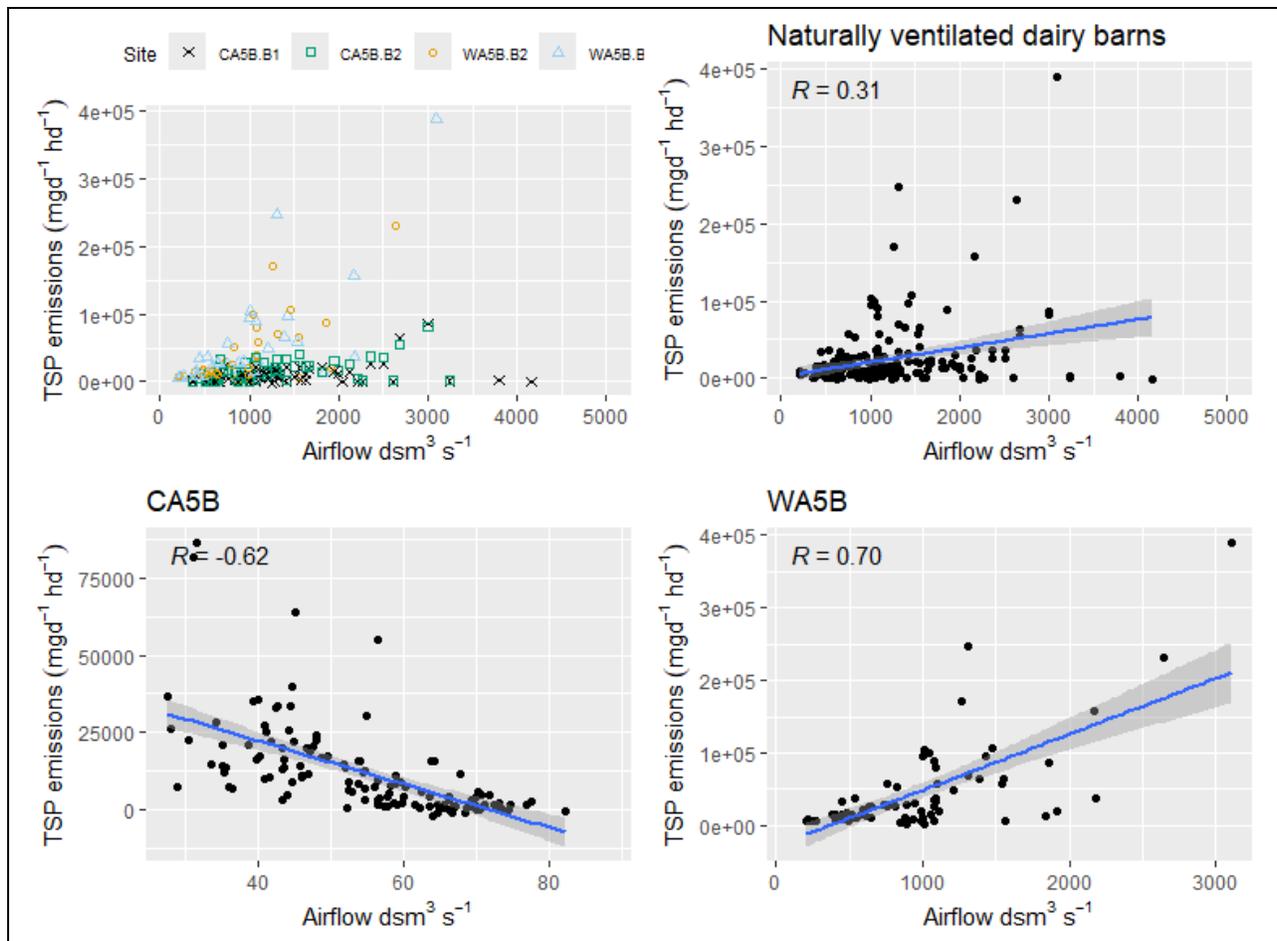


Figure 3.60: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus airflow.

3.2 Ambient

Table 3.2: Summary of naturally ventilated dairy barns R² values for ambient parameters.

Emissions	Parameter	R	R2	Strength
NH ₃ (kgd ⁻¹)	Ambient Temperature (C)	-0.26	0.07	slight or weak
H ₂ S (gd ⁻¹)	Ambient Temperature (C)	-0.17	0.03	slight or weak
PM ₁₀ (gd ⁻¹)	Ambient Temperature (C)	0.11	0.01	slight or weak
PM _{2.5} (gd ⁻¹)	Ambient Temperature (C)	0.27	0.07	slight or weak
TSP (gd ⁻¹)	Ambient Temperature (C)	0.22	0.05	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	-0.27	0.07	slight or weak
H ₂ S (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	-0.17	0.03	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.1	0.01	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.23	0.05	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Ambient Temperature (C)	0.29	0.08	slight or weak
NH ₃ (kgd ⁻¹)	Ambient Relative humidity (%)	-0.45	0.2	modest
H ₂ S (gd ⁻¹)	Ambient Relative humidity (%)	-0.15	0.02	slight or weak
PM ₁₀ (gd ⁻¹)	Ambient Relative humidity (%)	-0.25	0.06	slight or weak
PM _{2.5} (gd ⁻¹)	Ambient Relative humidity (%)	-0.16	0.03	slight or weak
TSP (gd ⁻¹)	Ambient Relative humidity (%)	-0.35	0.12	slight or weak
NH ₃ (gd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.46	0.21	modest
H ₂ S (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.1	0.01	slight or weak
PM ₁₀ (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.23	0.05	slight or weak
PM _{2.5} (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.16	0.03	slight or weak
TSP (mgd ⁻¹ hd ⁻¹)	Ambient Relative humidity (%)	-0.41	0.17	slight or weak

3.2.1 Ammonia (NH₃)

3.2.1.1 Ambient temperature

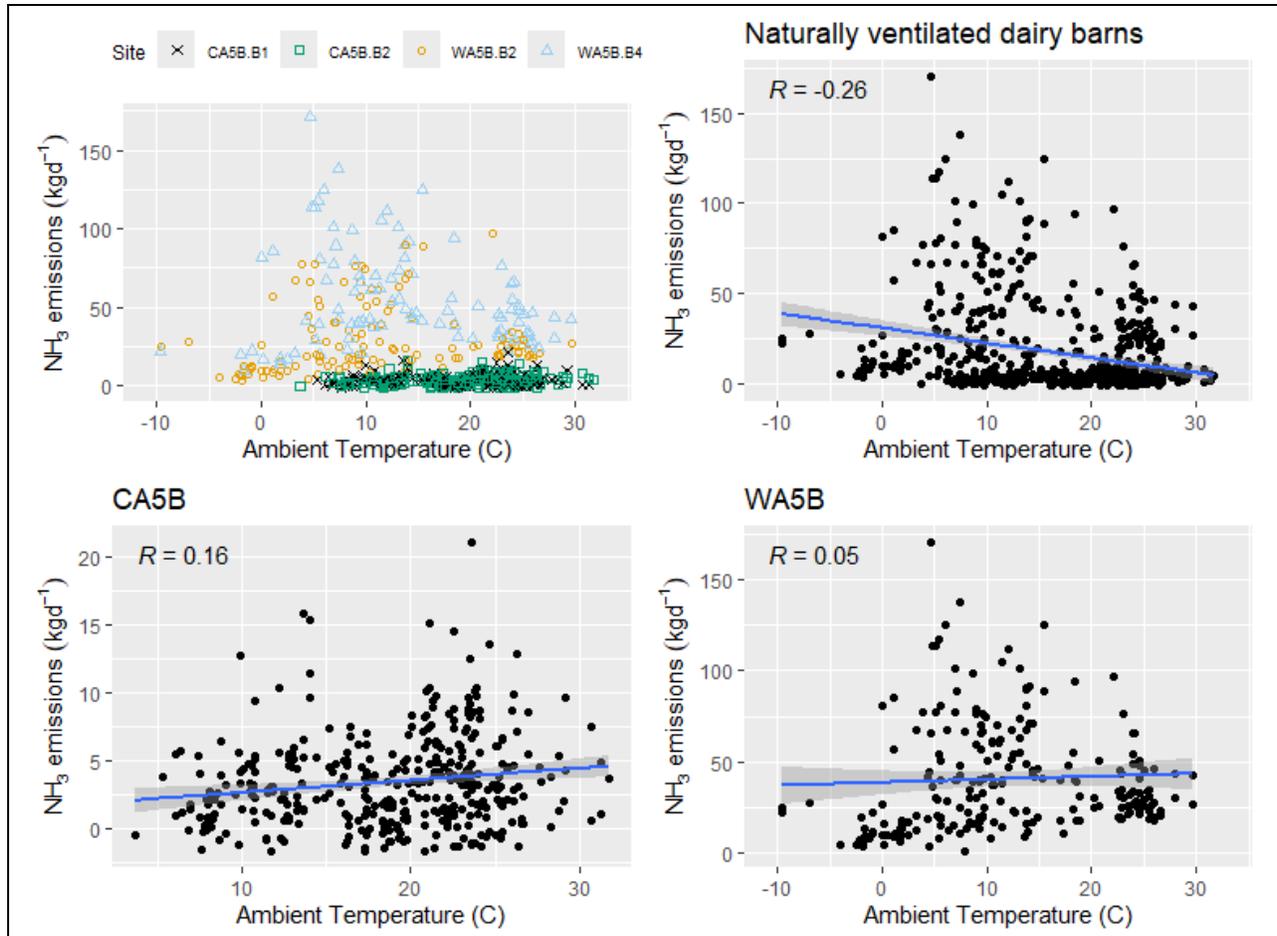


Figure 3.61: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus ambient temperature.

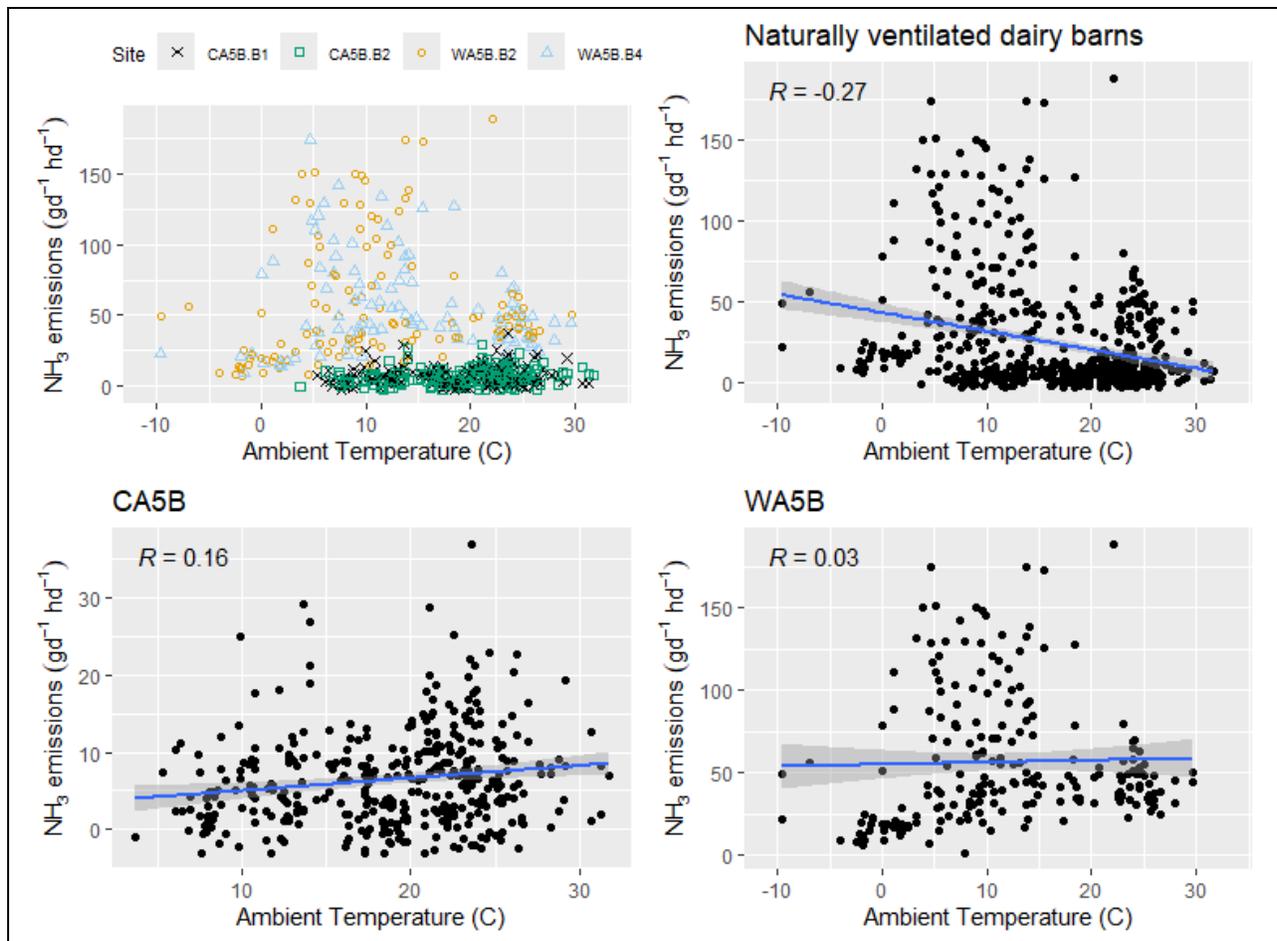


Figure 3.62: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus ambient temperature.

3.2.1.2 Ambient relative humidity

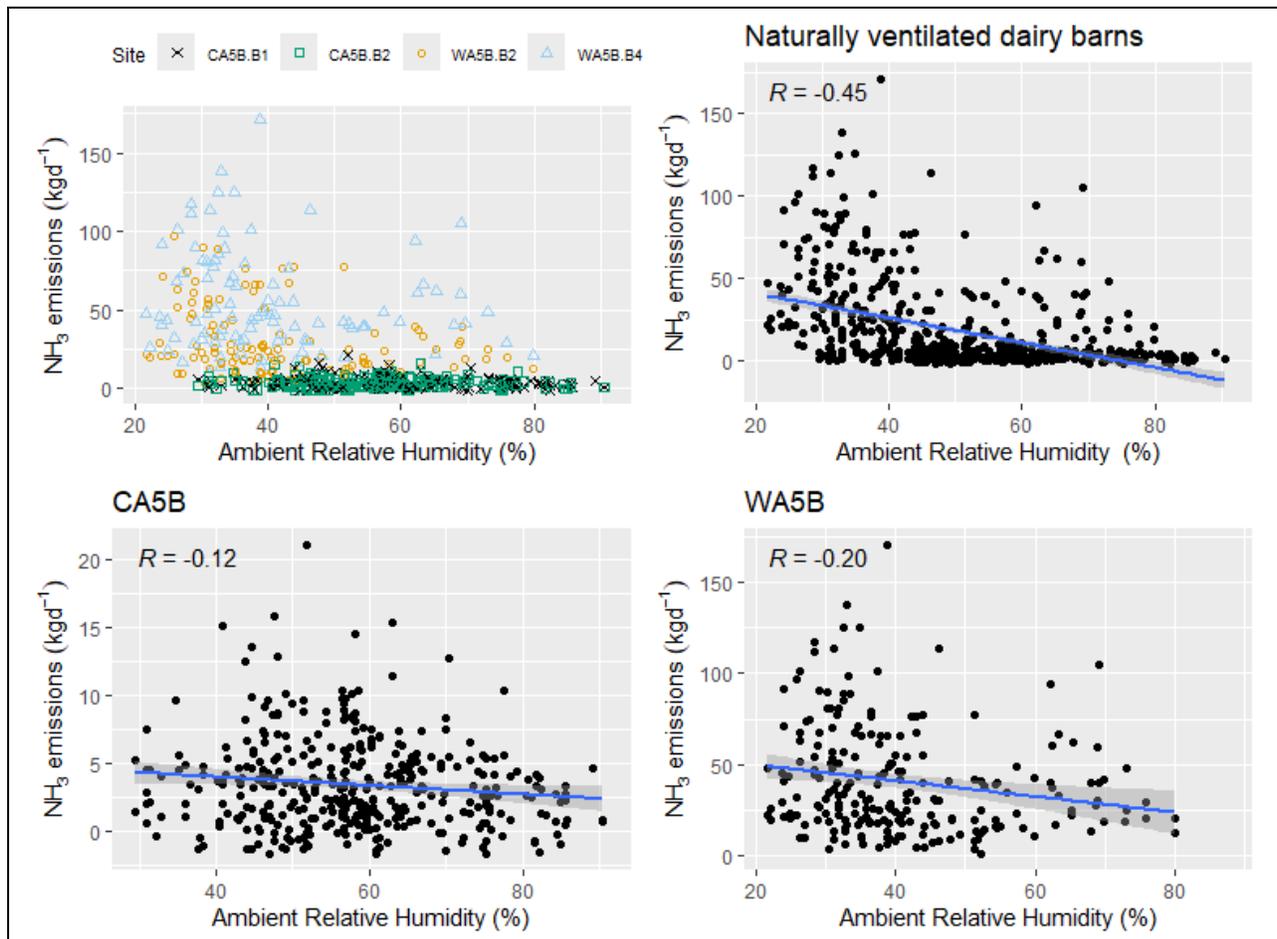


Figure 3.63: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus ambient relative humidity.

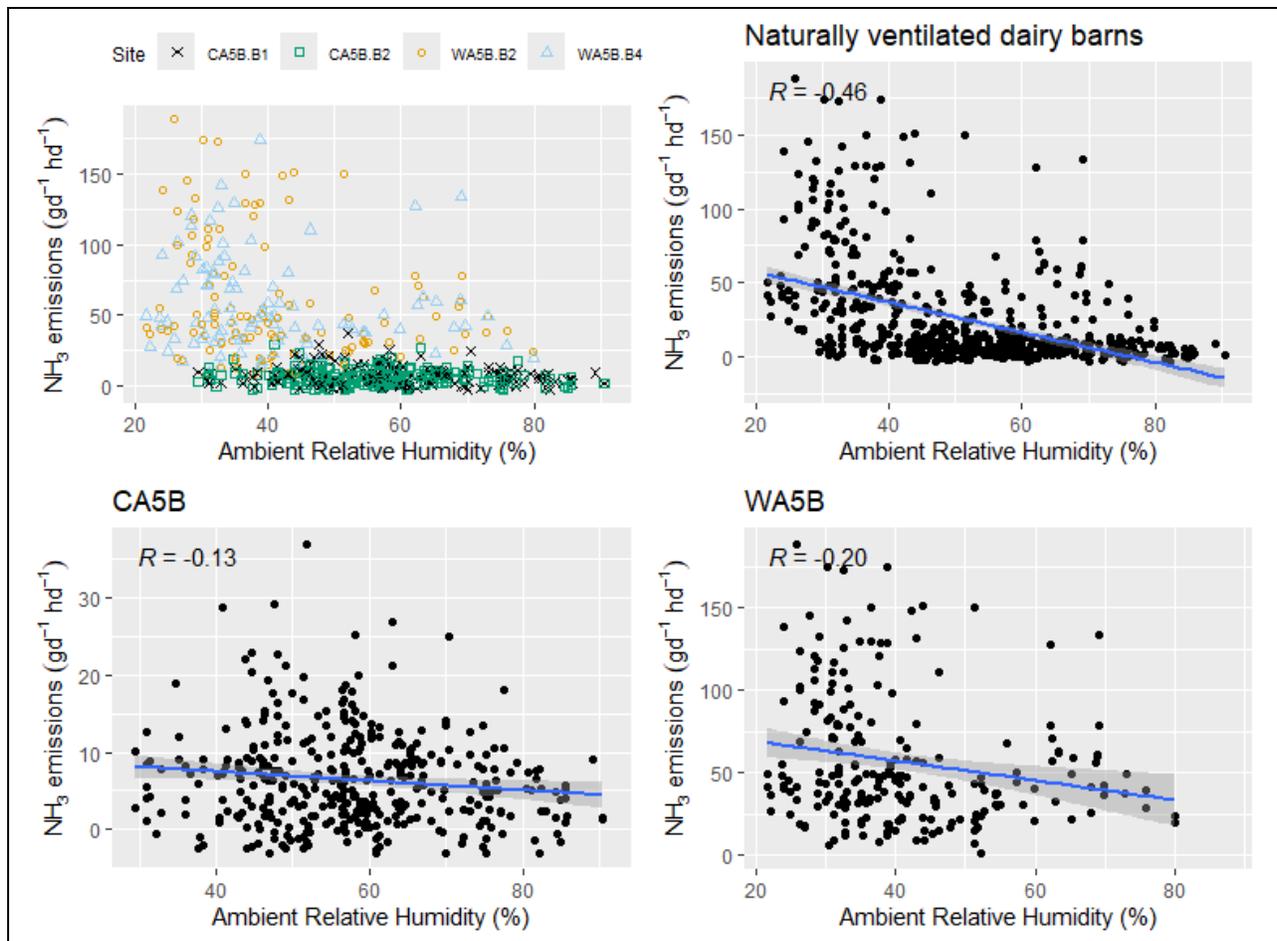


Figure 3.64: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus ambient relative humidity.

3.2.1.3 Air pressure

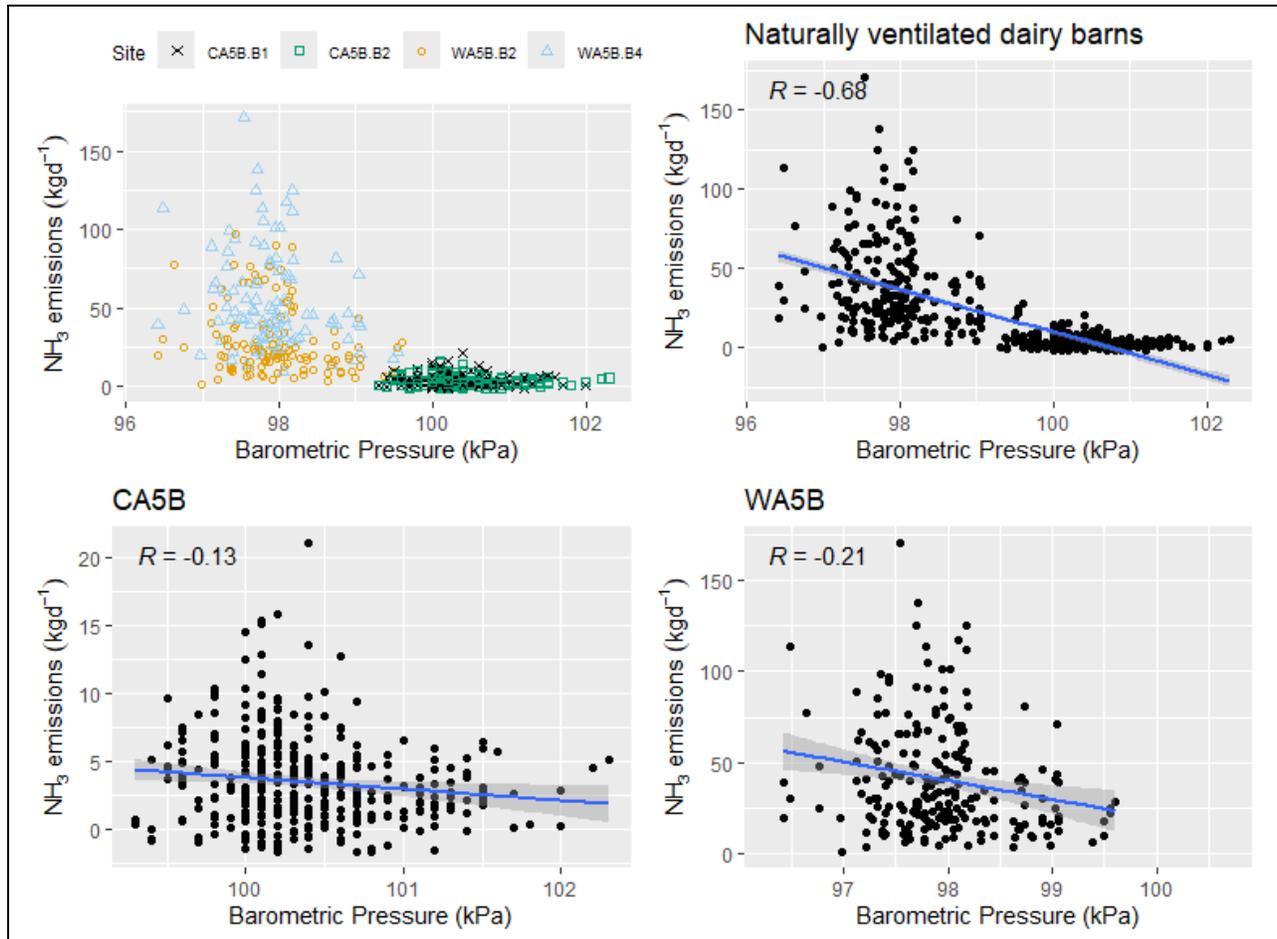


Figure 3.65: Scatter plot of naturally ventilated dairy barns NH₃ emissions (kg d⁻¹) versus air pressure.

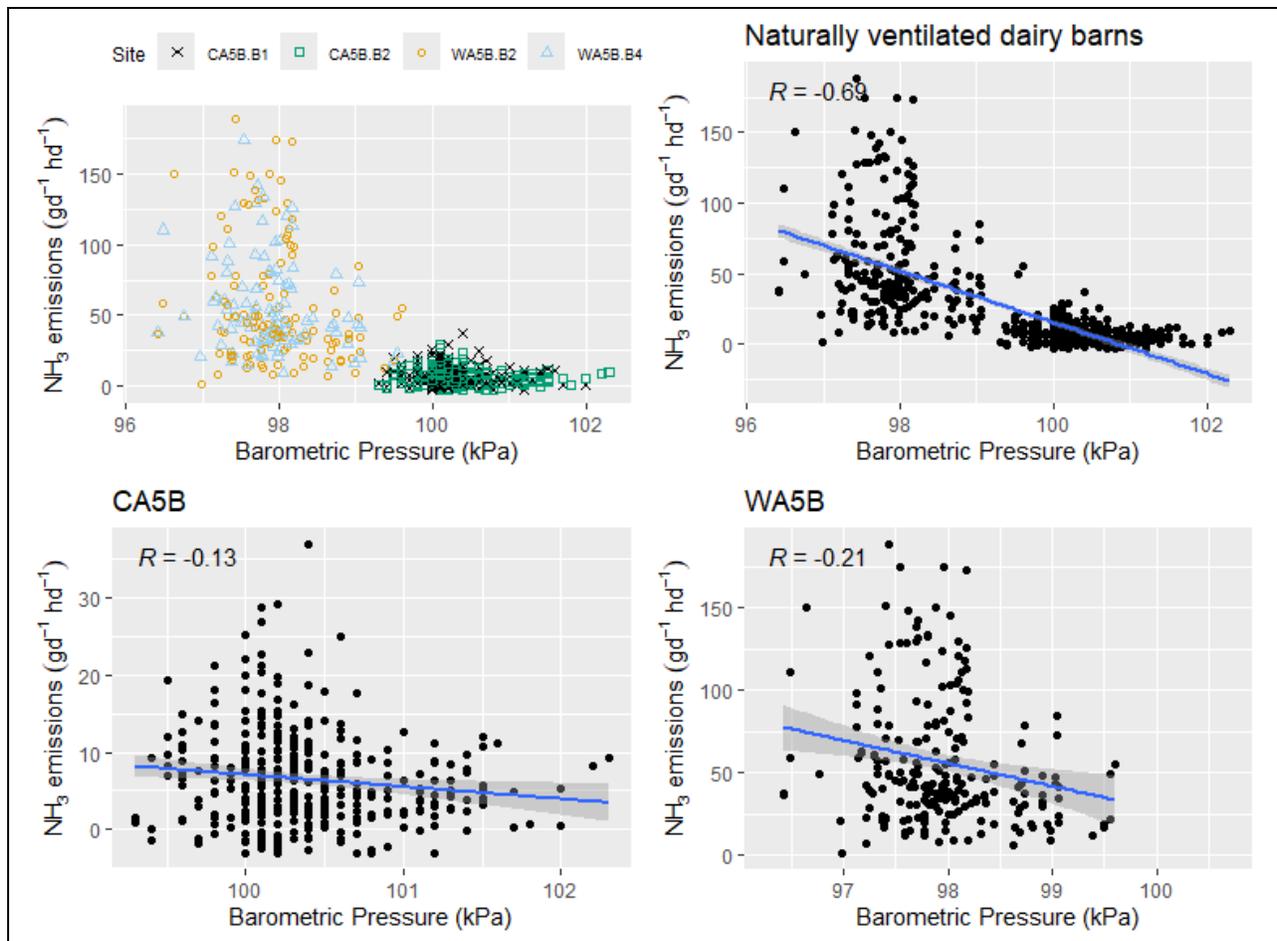


Figure 3.66: Scatter plot of naturally ventilated dairy barns NH₃ emissions (g d⁻¹hd⁻¹) versus air pressure.

3.2.2 Hydrogen Sulfide (H₂S)

3.2.2.1 Ambient temperature

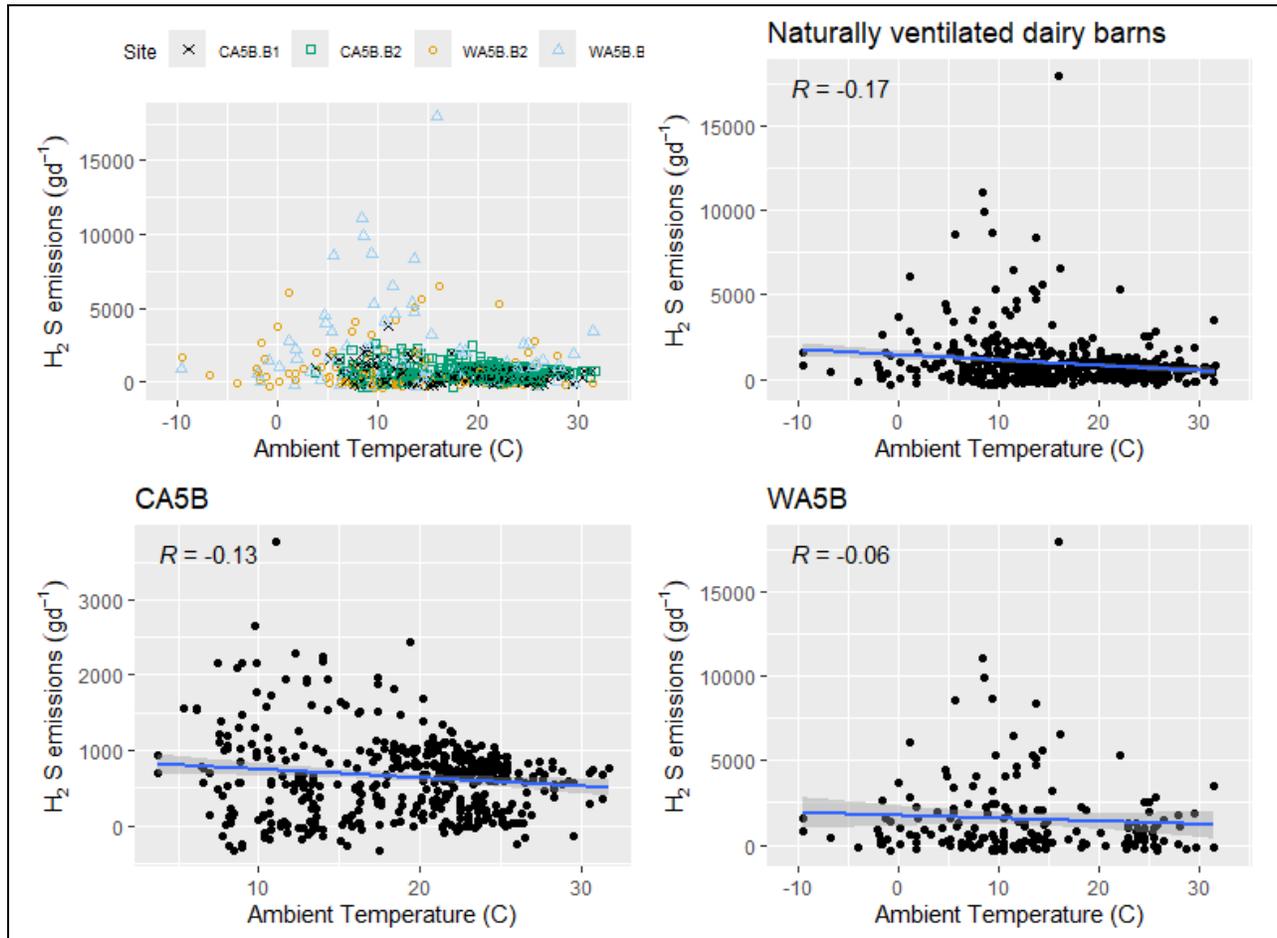


Figure 3.67: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus ambient temperature.

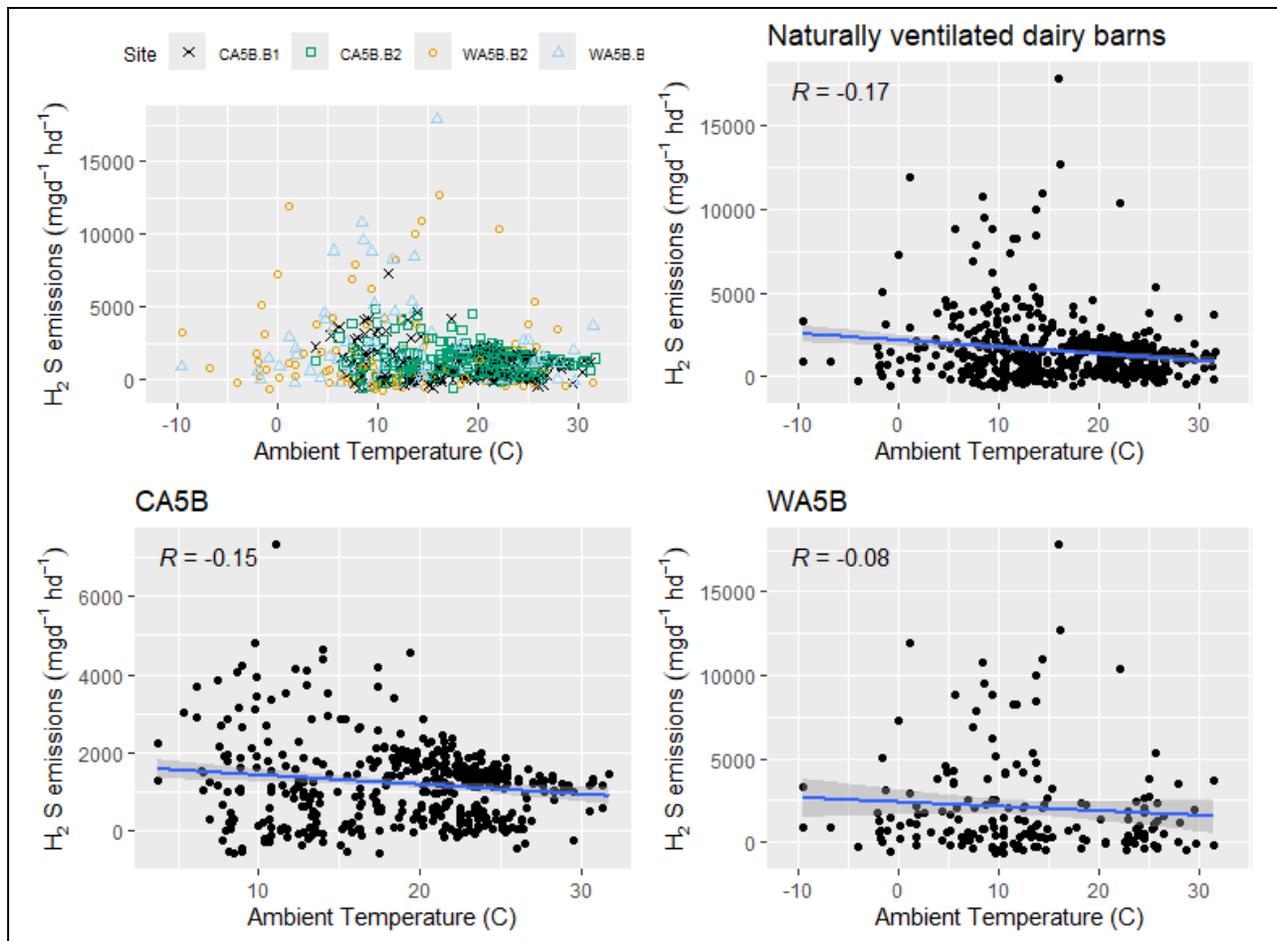


Figure 3.68: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

3.2.2.2 Ambient relative humidity

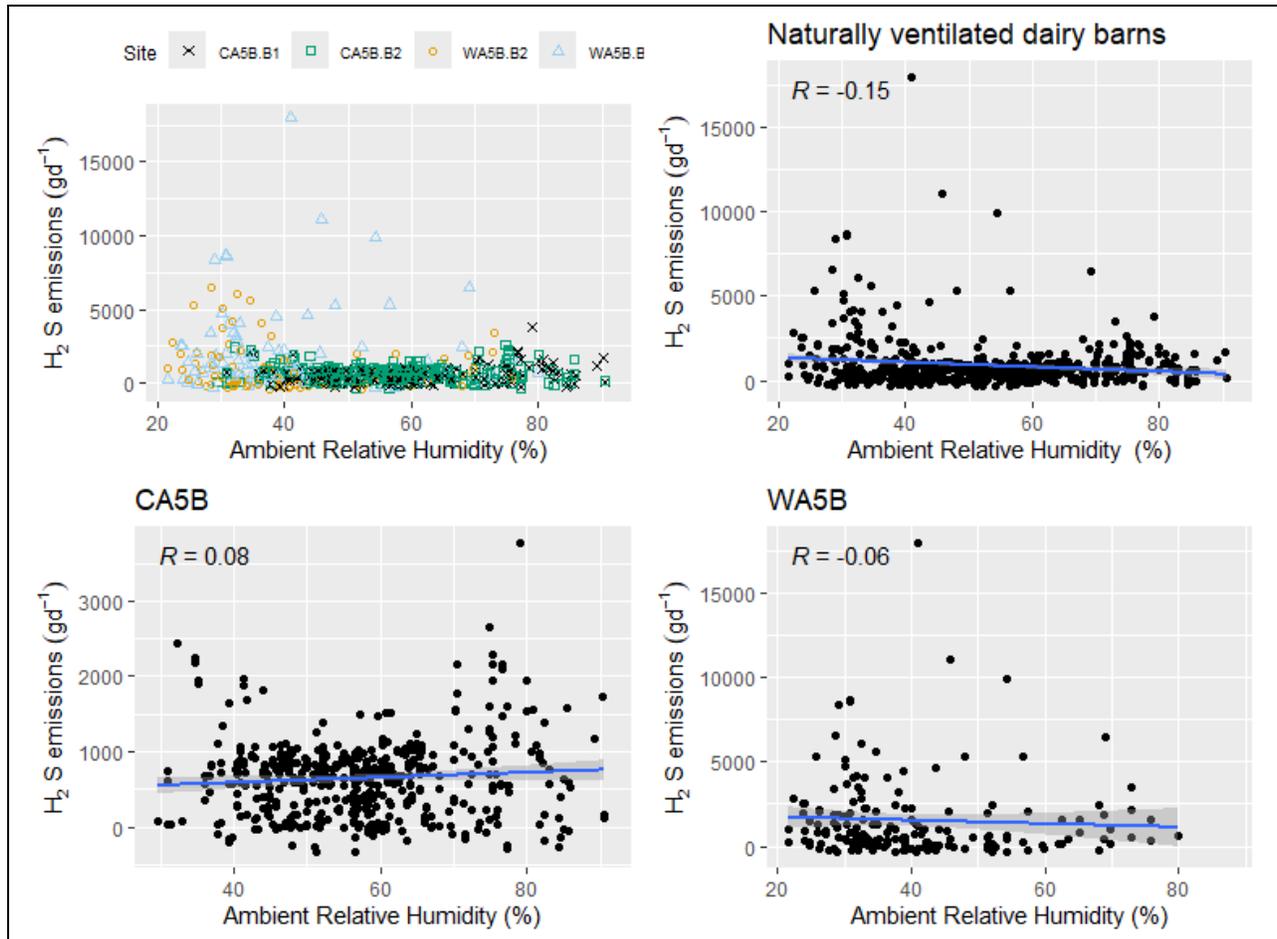


Figure 3.69: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus ambient relative humidity.

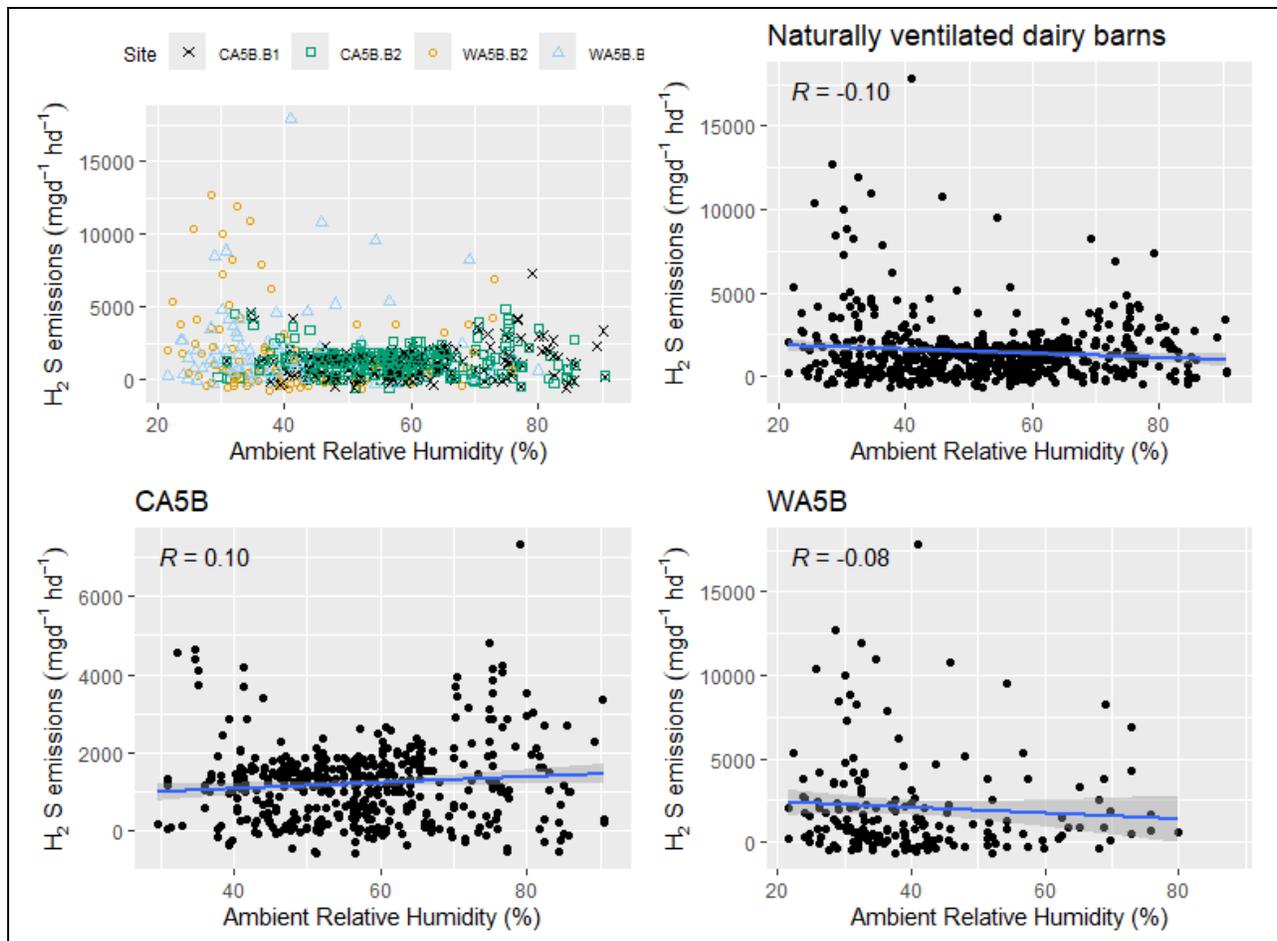


Figure 3.70: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

3.2.2.3 Air pressure

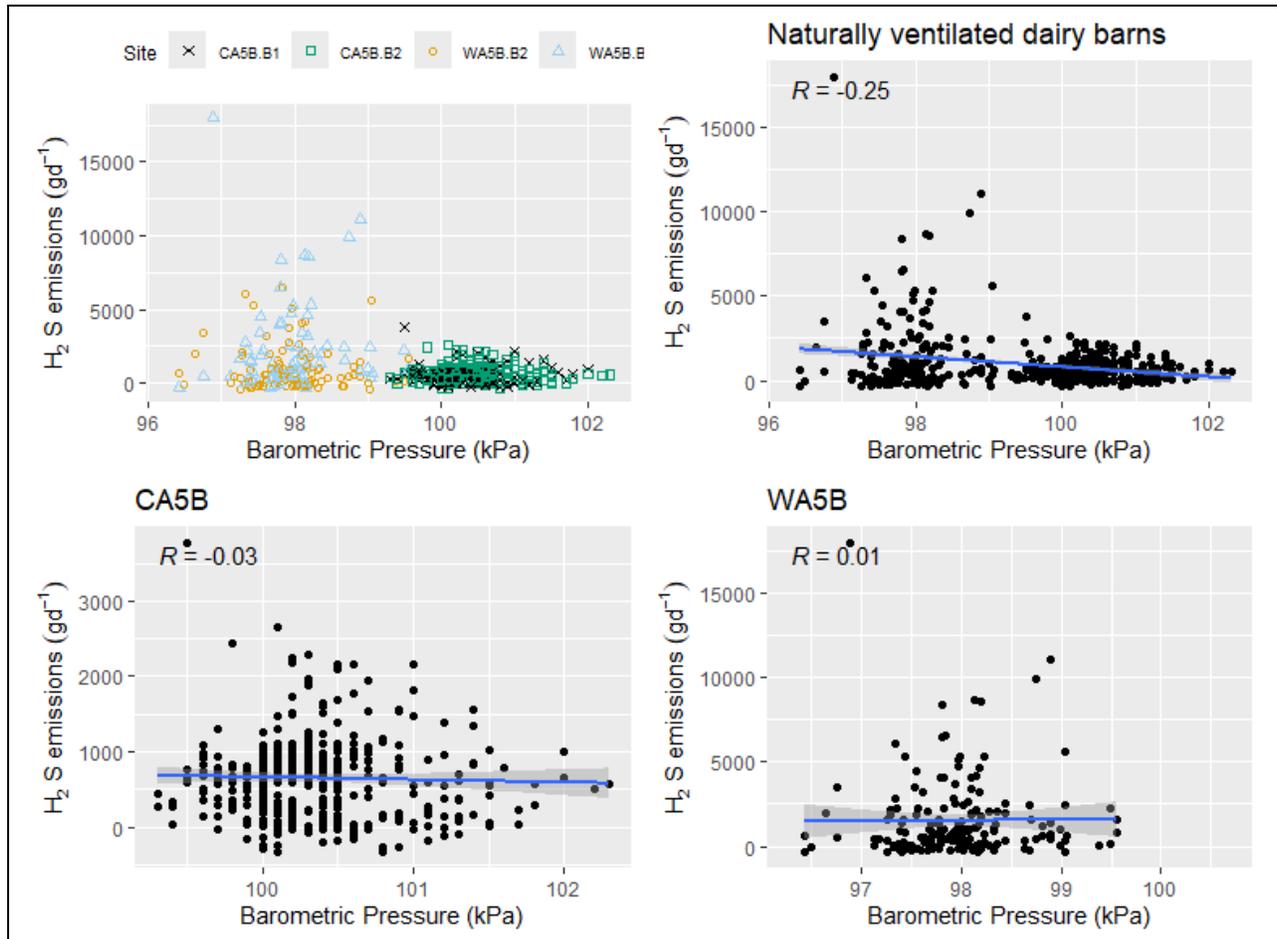


Figure 3.71: Scatter plot of naturally ventilated dairy barns H₂S emissions (g d⁻¹) versus air pressure.

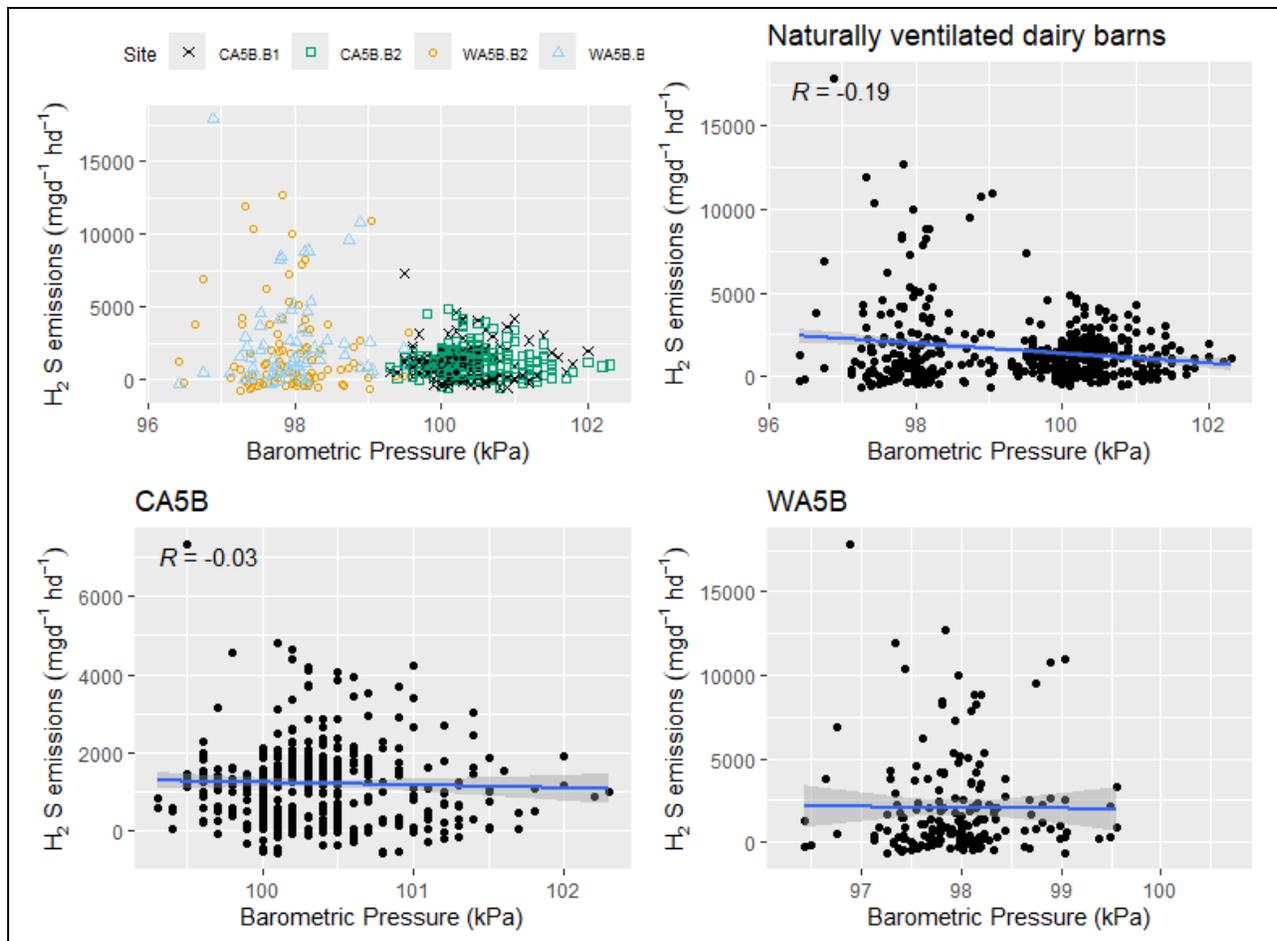


Figure 3.72: Scatter plot of naturally ventilated dairy barns H₂S emissions (mg d⁻¹hd⁻¹) versus air pressure.

3.2.3 Particulate Matter (PM₁₀)

3.2.3.1 Ambient temperature

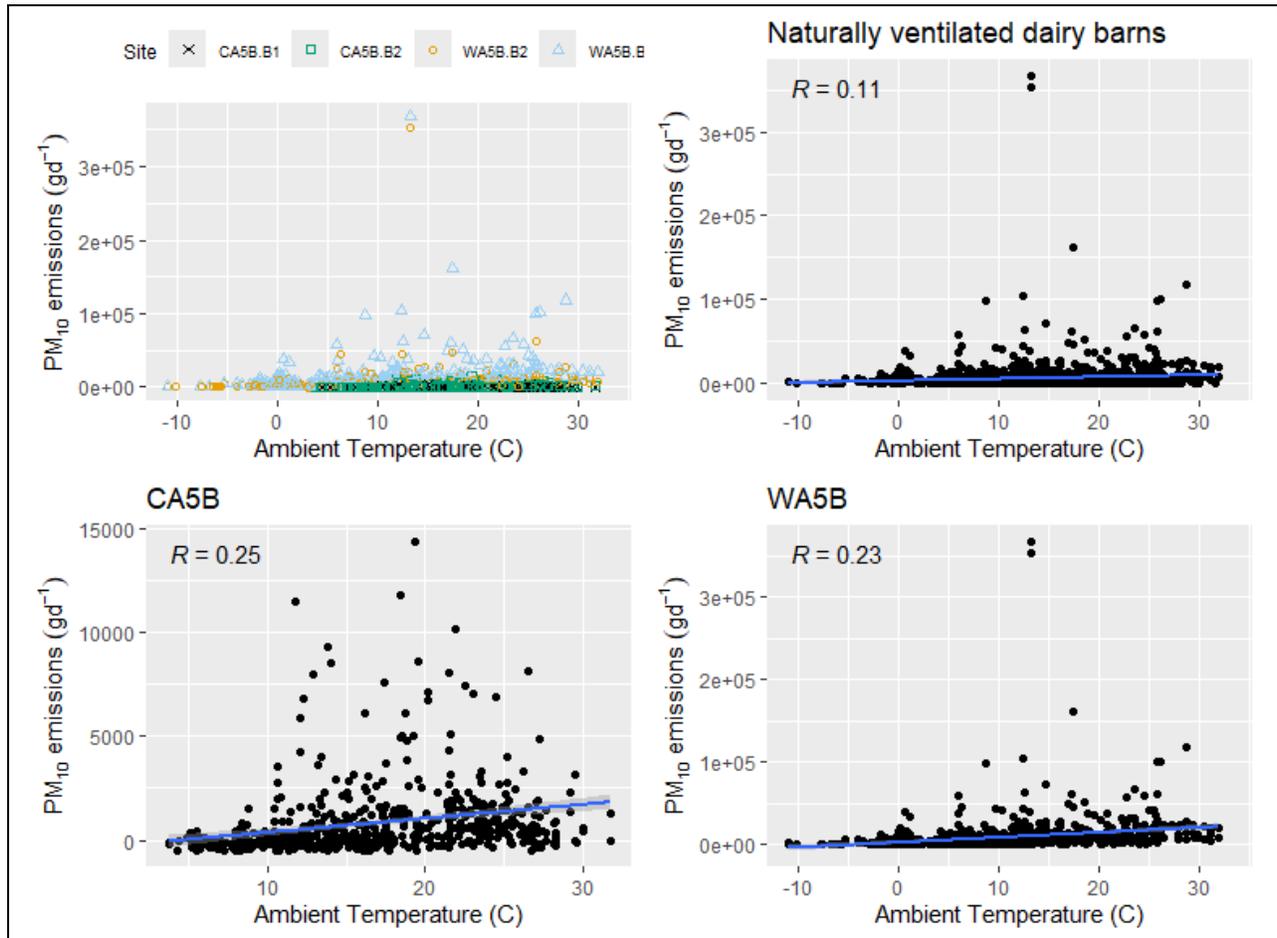


Figure 3.73: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus ambient temperature.

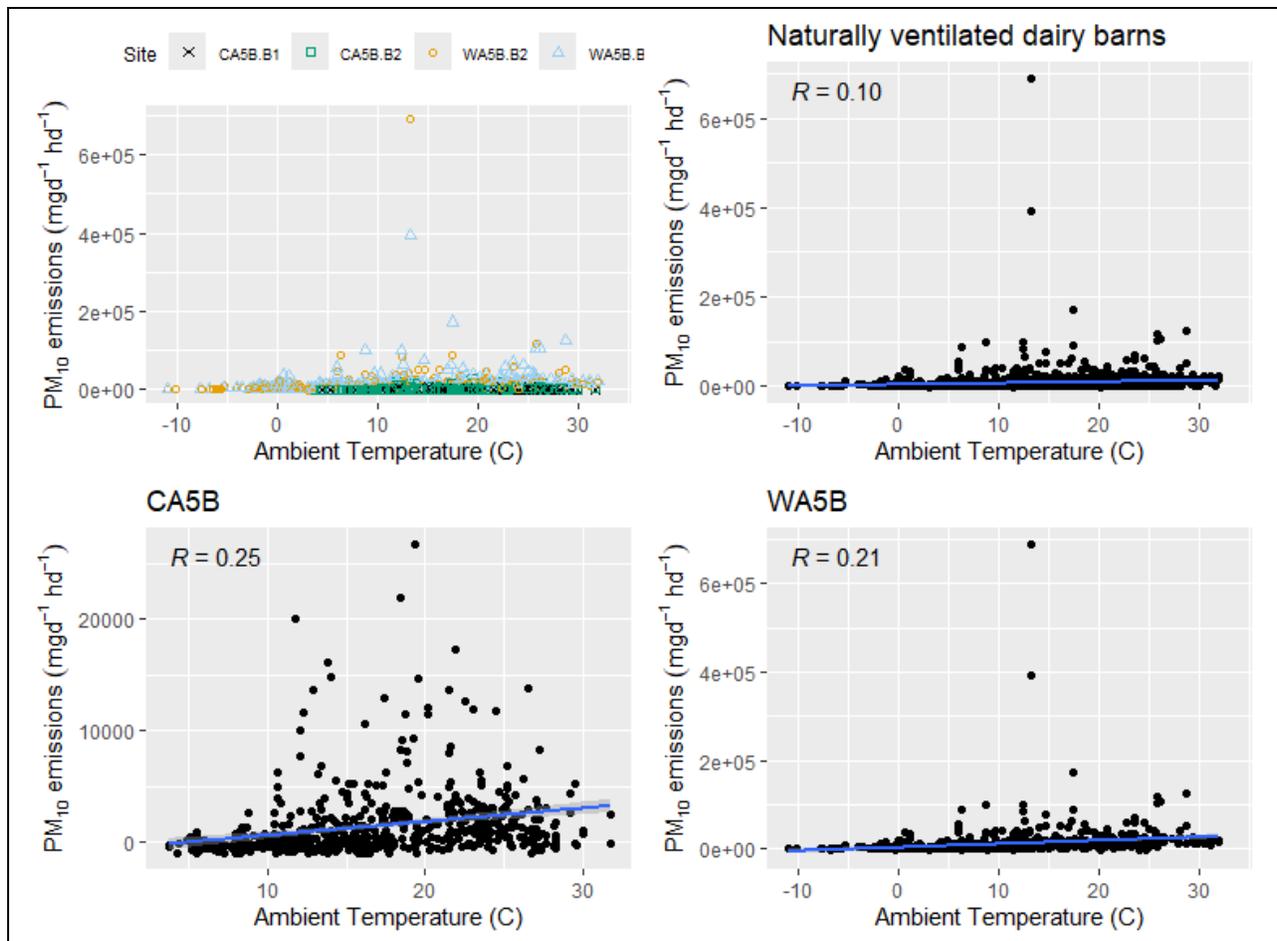


Figure 3.74: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

3.2.3.2 Ambient relative humidity

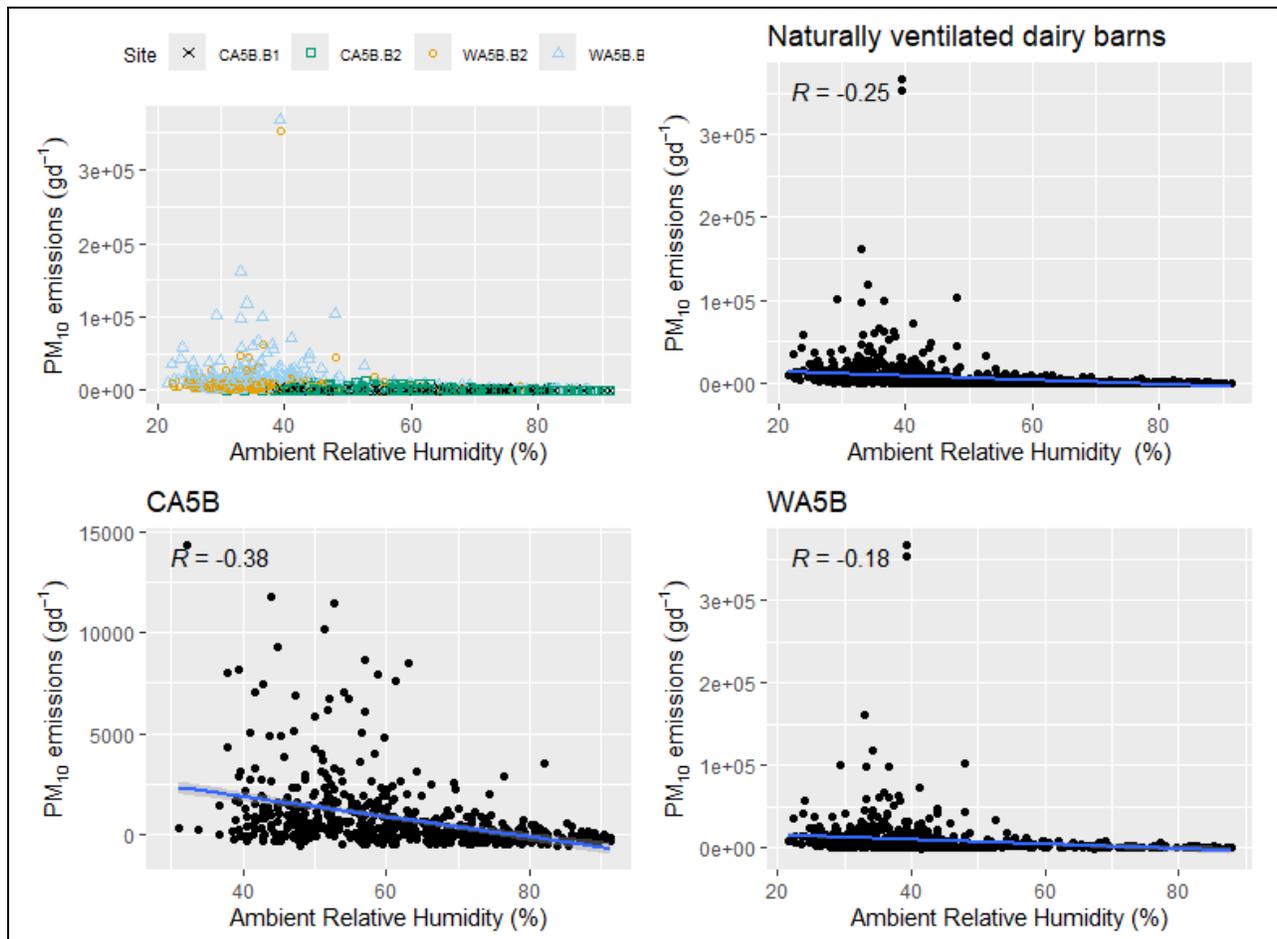


Figure 3.75: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus ambient relative humidity.

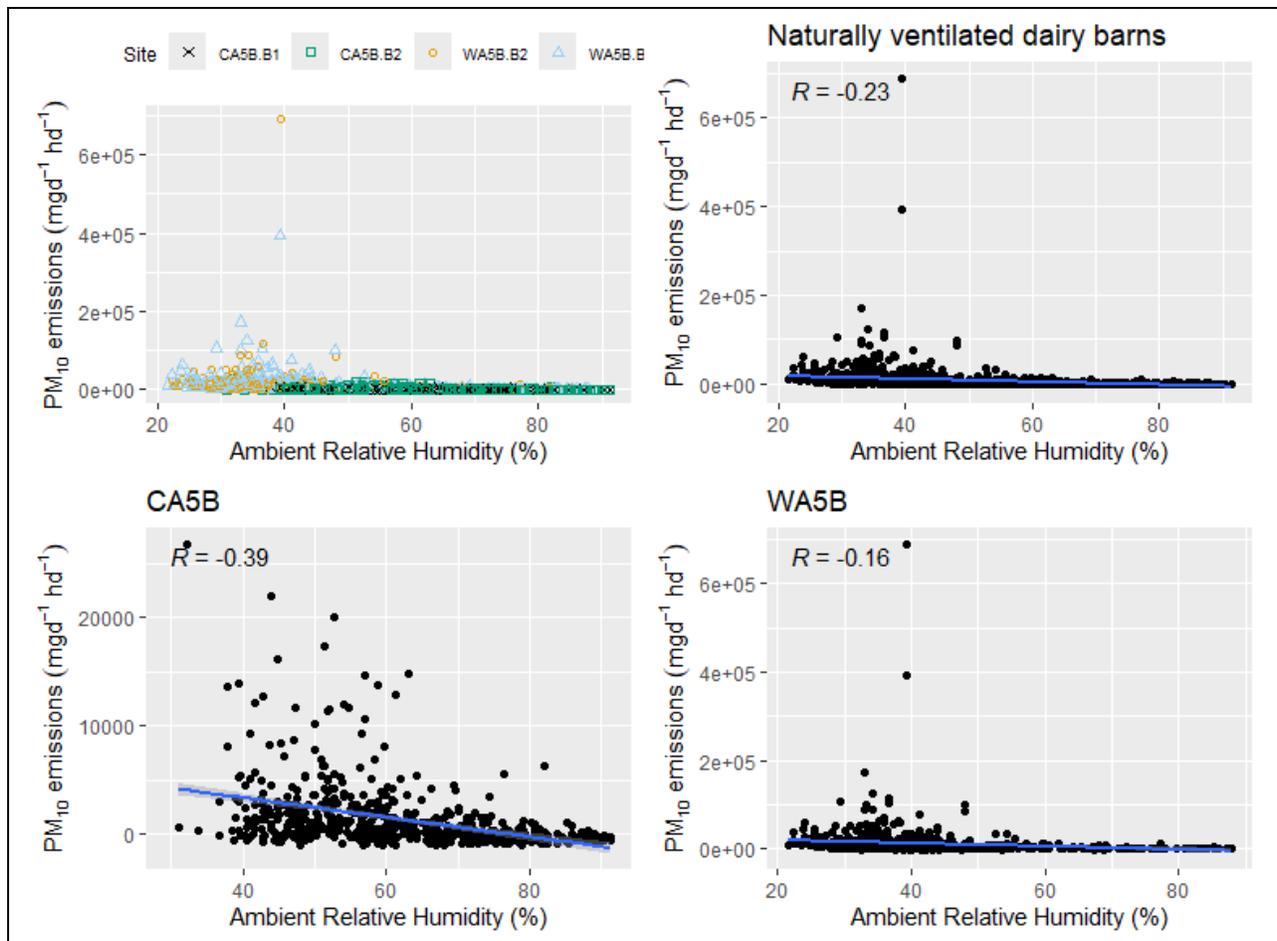


Figure 3.76: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus ambient relative humidity.

3.2.3.3 Air pressure

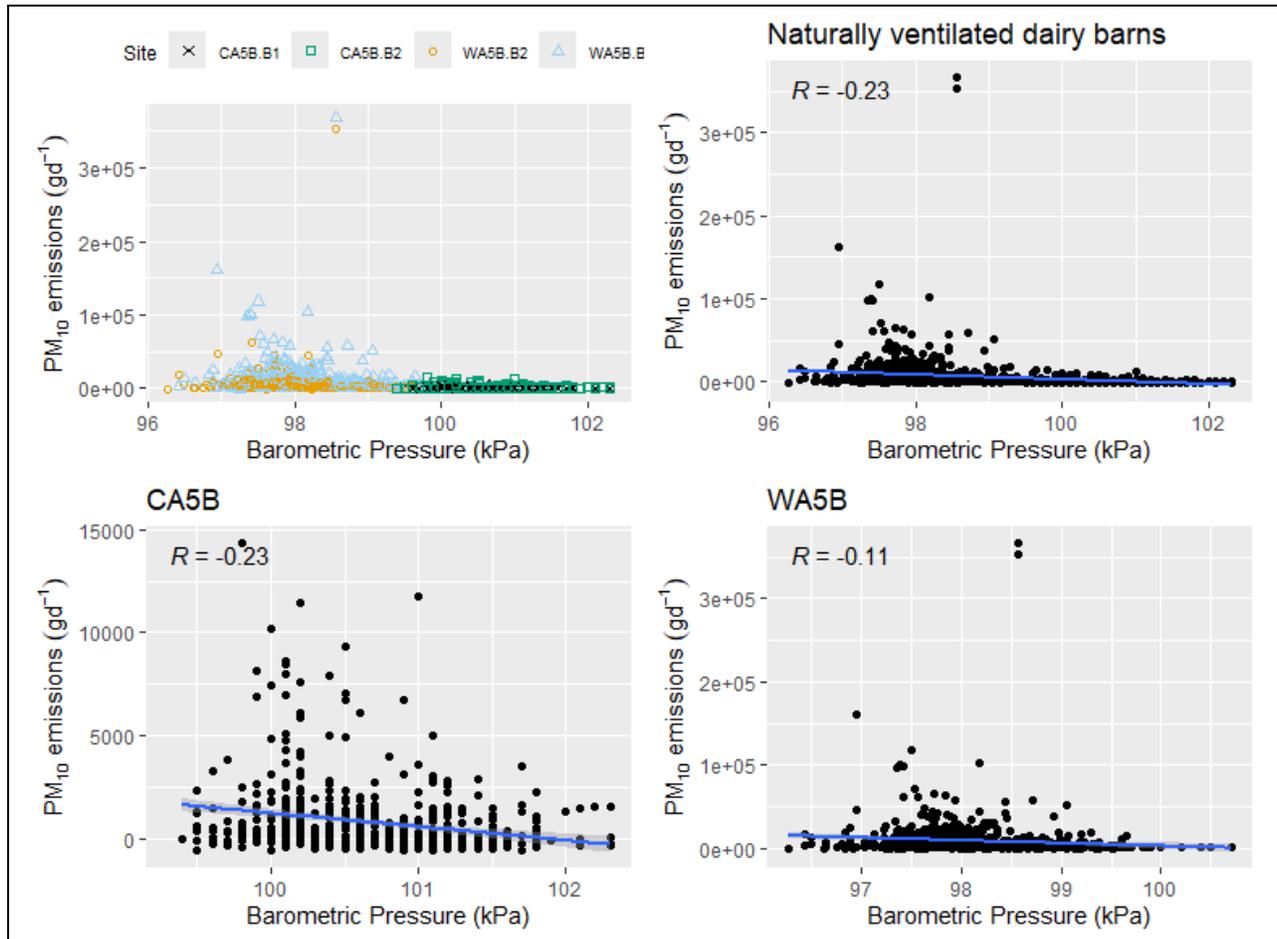


Figure 3.77: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (g d⁻¹) versus air pressure.

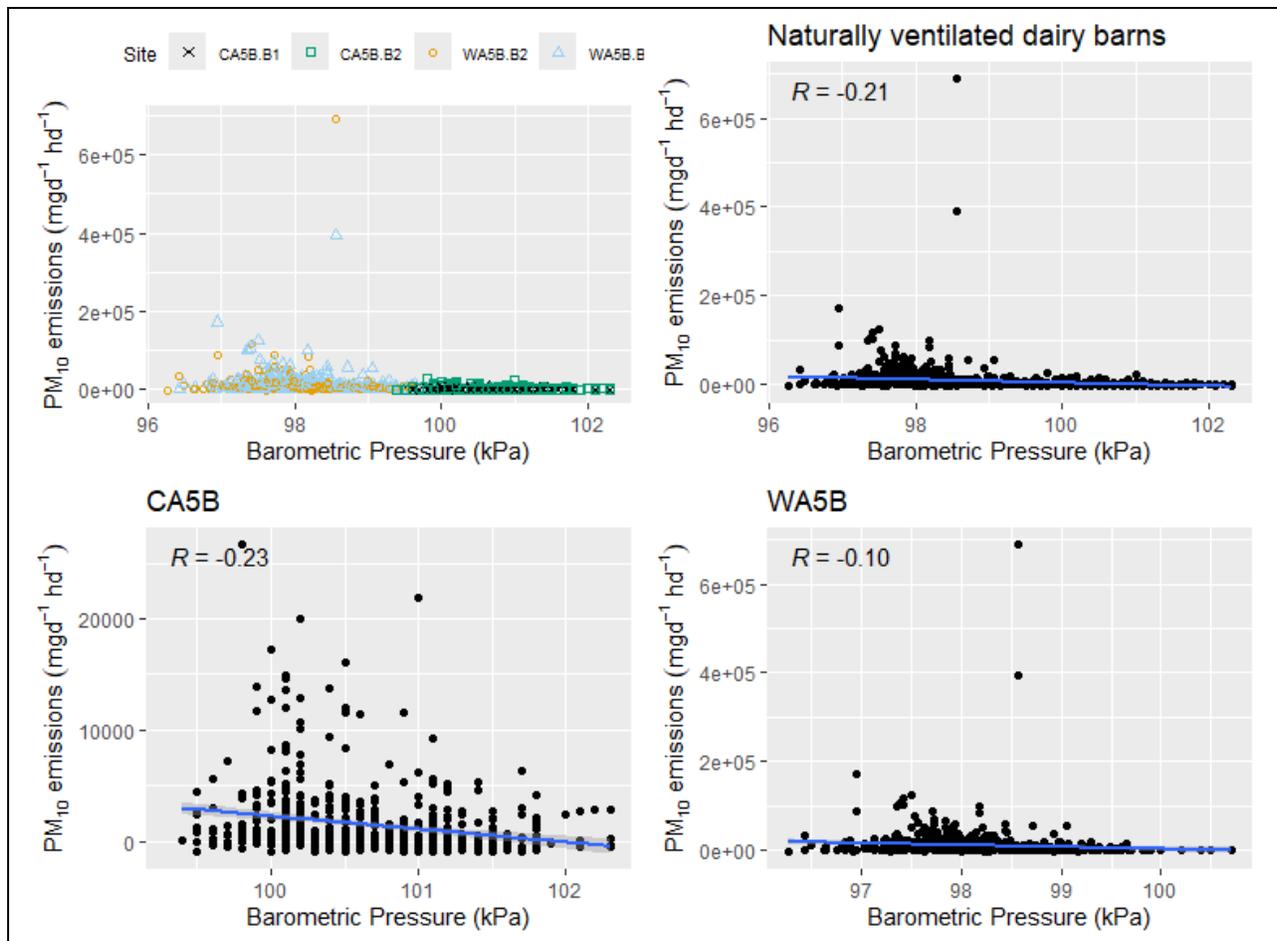


Figure 3.78: Scatter plot of naturally ventilated dairy barns PM₁₀ emissions (mg d⁻¹hd⁻¹) versus air pressure.

3.2.4 Particulate Matter (PM_{2.5})

3.2.4.1 Ambient temperature

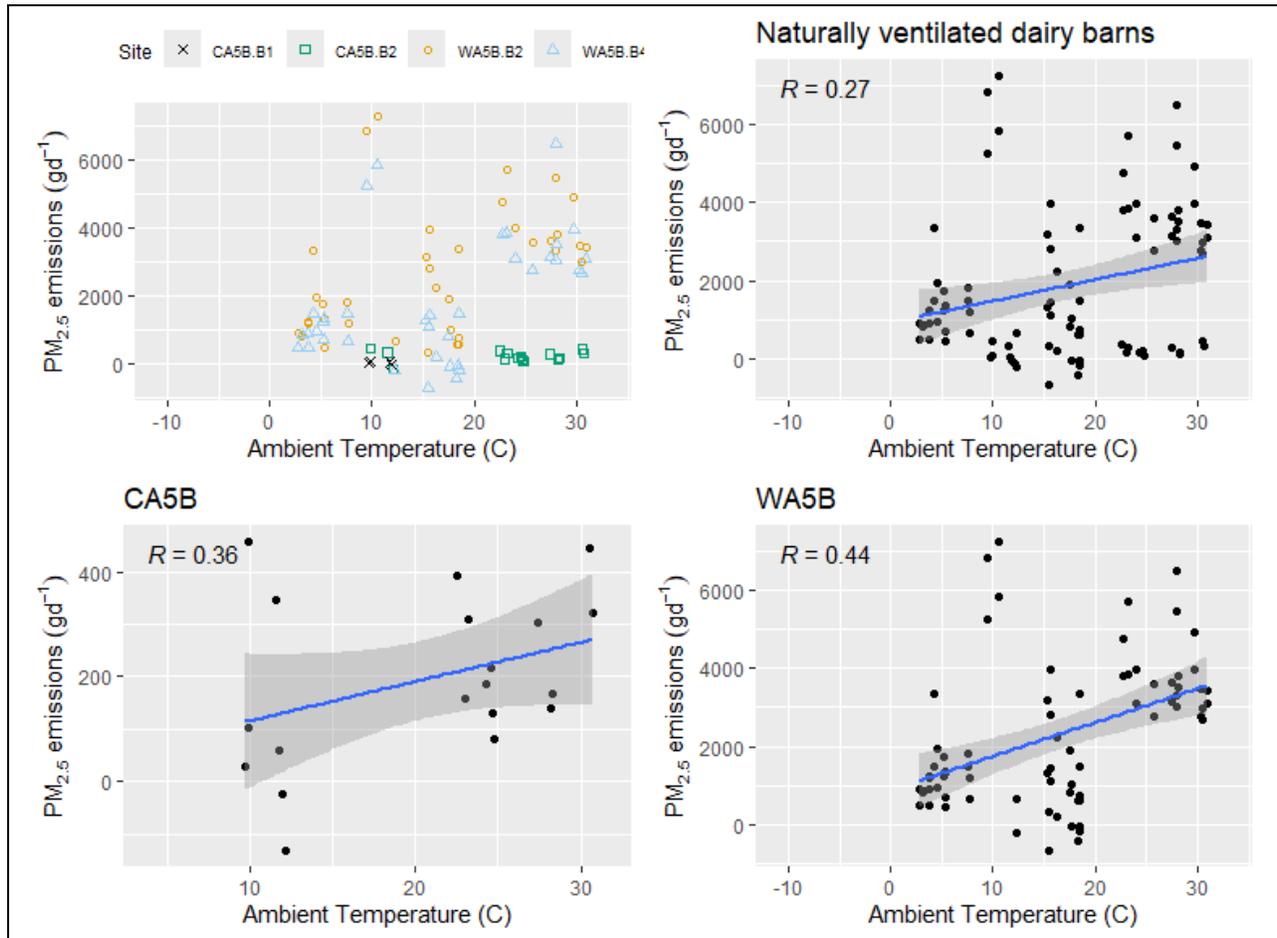


Figure 3.79: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus ambient temperature.

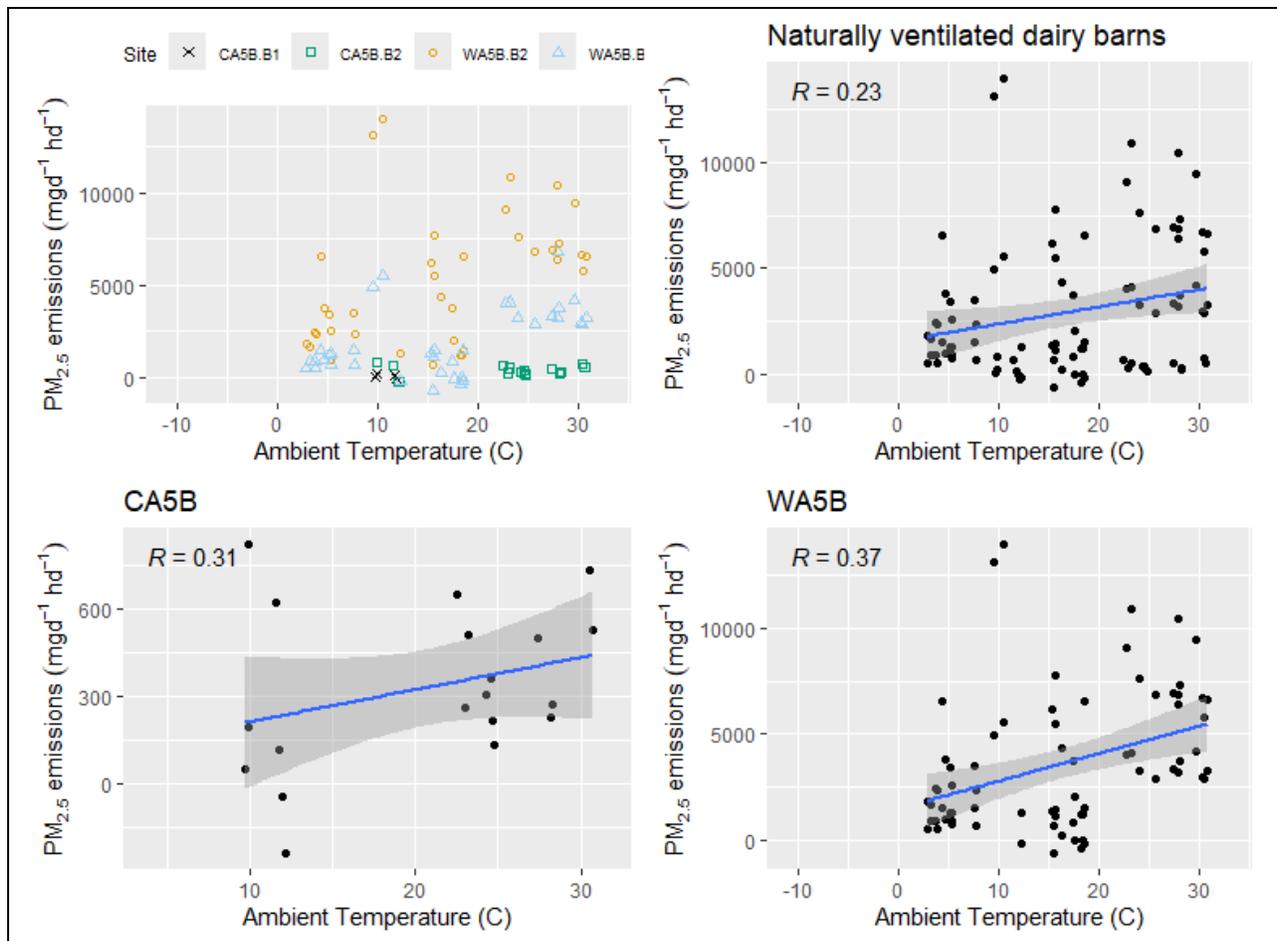


Figure 3.80: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

3.2.4.2 Ambient relative humidity

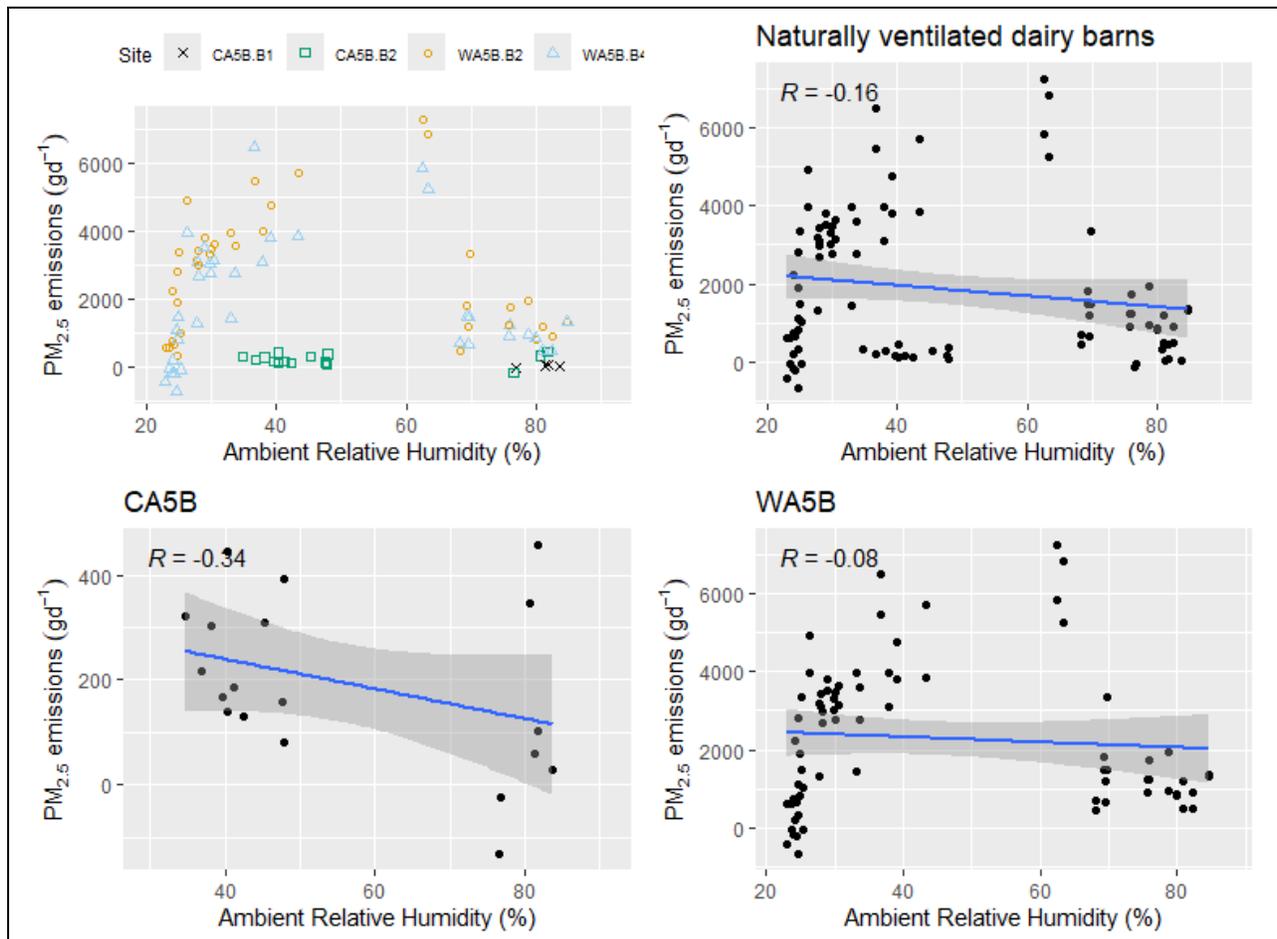


Figure 3.81: Scatter plot of naturally ventilated dairy barns $PM_{2.5}$ emissions (gd^{-1}) versus ambient relative humidity.

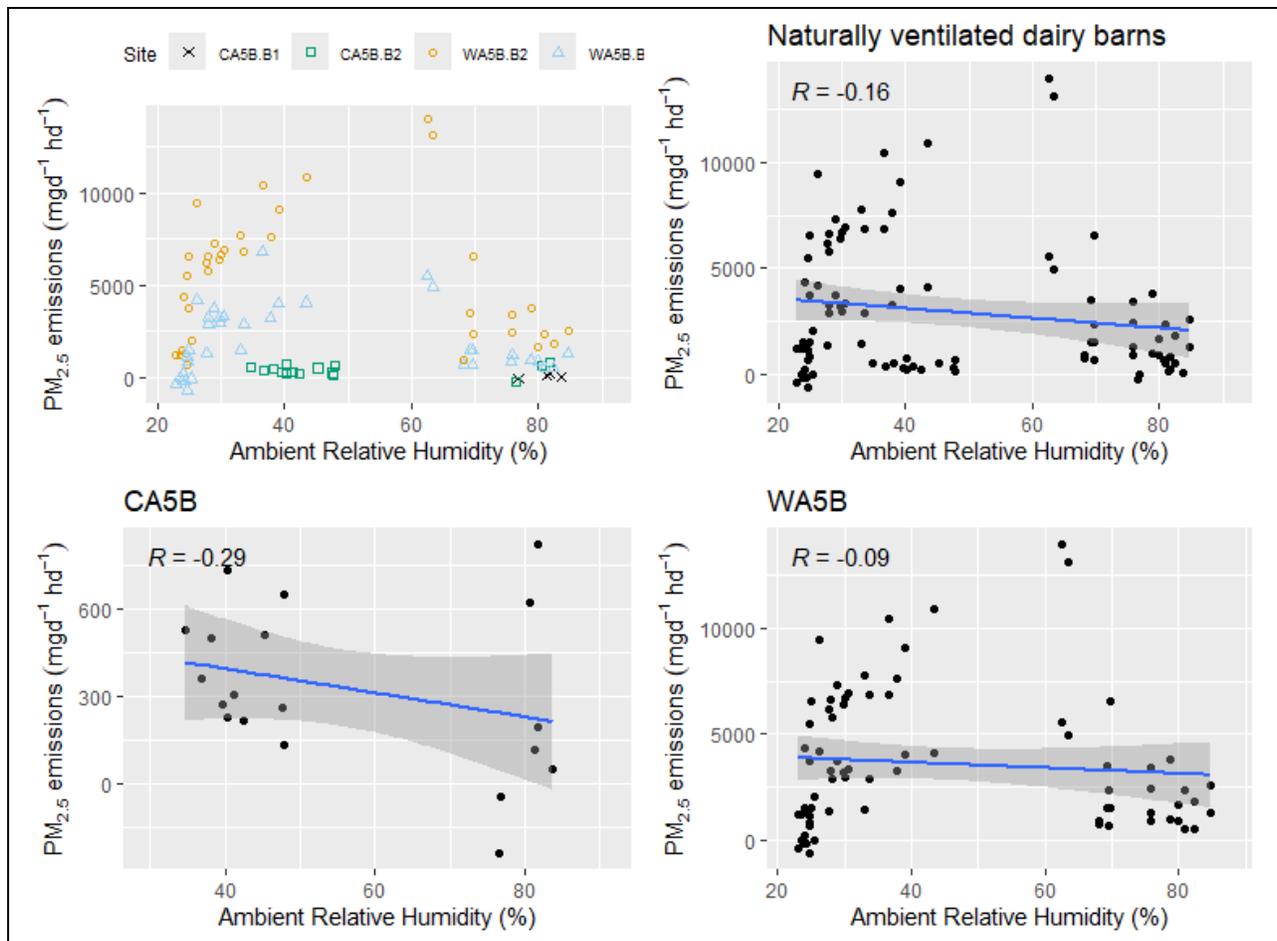


Figure 3.82: Scatter plot of naturally ventilated dairy barns $PM_{2.5}$ emissions ($mg\ d^{-1}hd^{-1}$) versus ambient relative humidity.

3.2.4.3 Air pressure

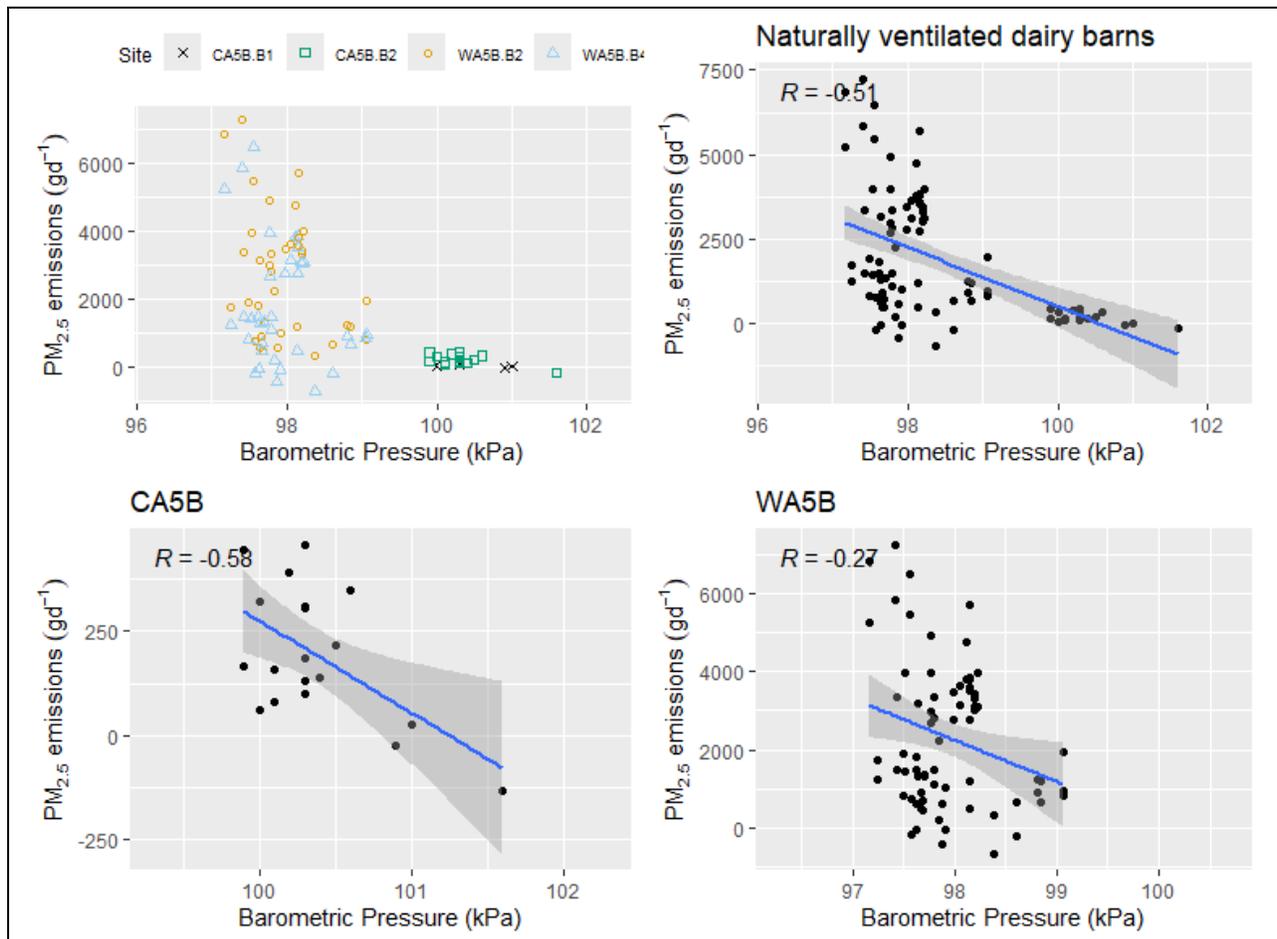


Figure 3.83: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (g d⁻¹) versus air pressure.

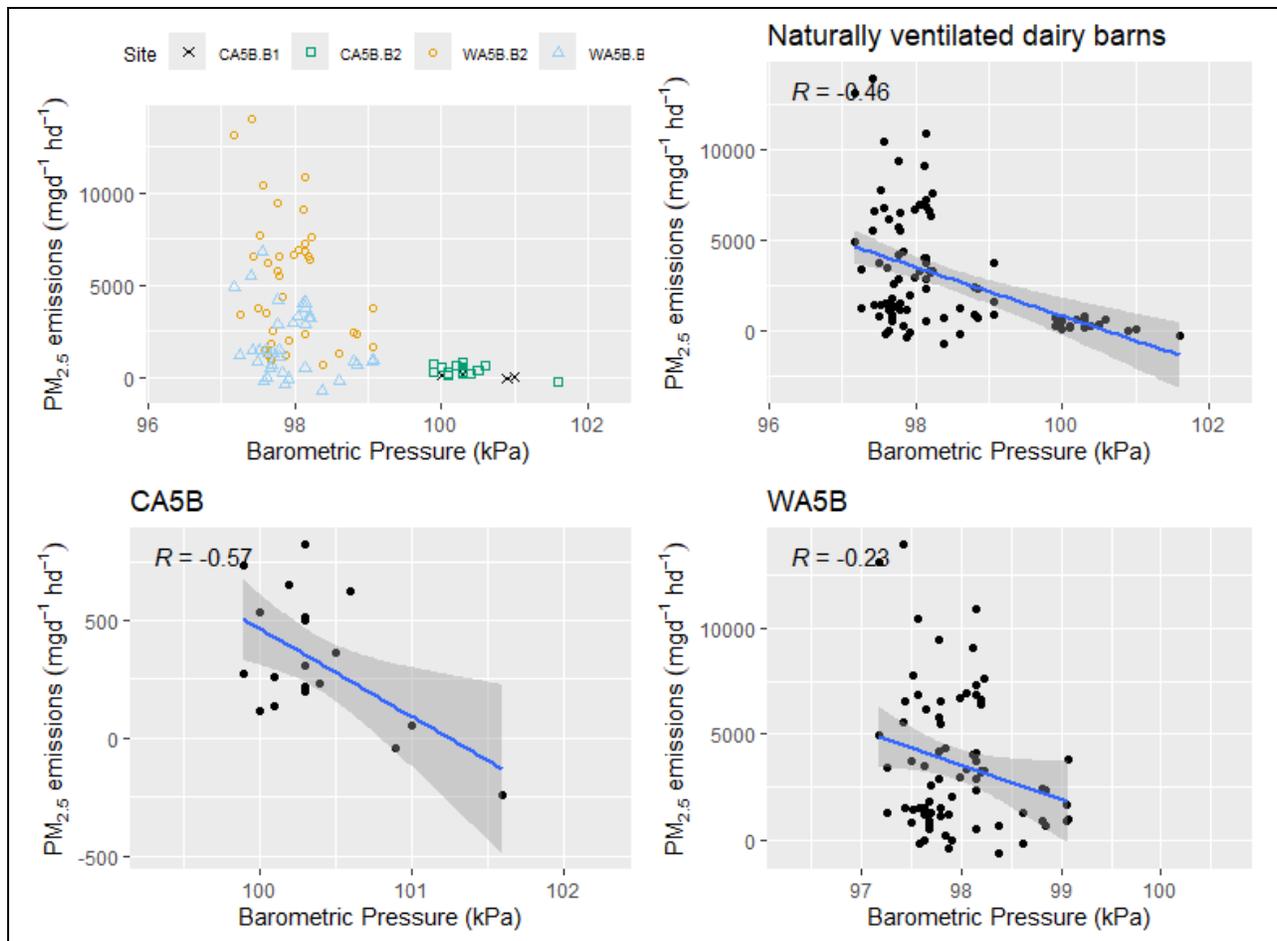


Figure 3.84: Scatter plot of naturally ventilated dairy barns PM_{2.5} emissions (mg d⁻¹hd⁻¹) versus air pressure.

3.2.5 Total Suspended Particulates (TSP)

3.2.5.1 Ambient temperature

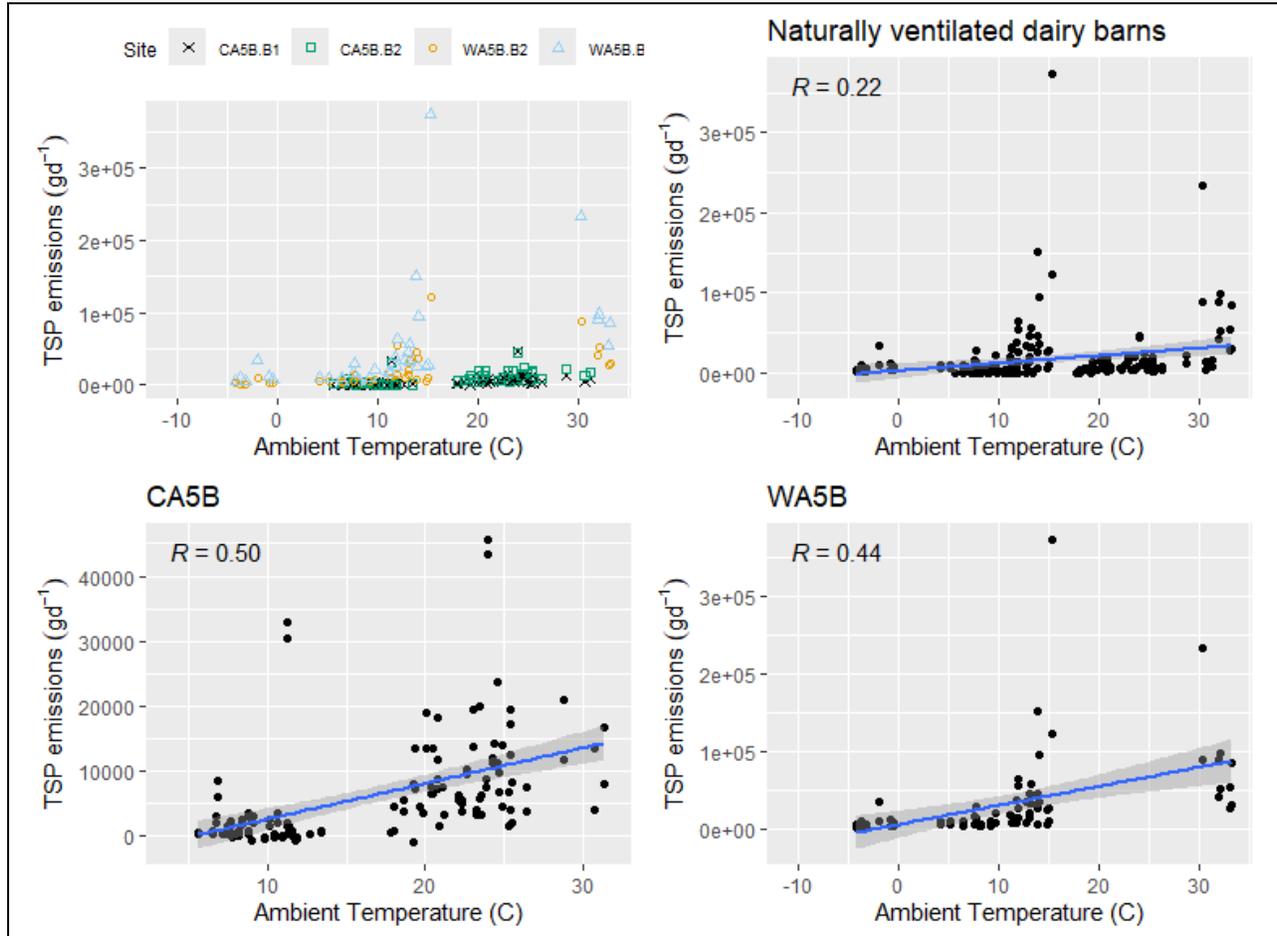


Figure 3.85: Scatter plot of naturally ventilated dairy barns TSP emissions (g d^{-1}) versus ambient temperature.

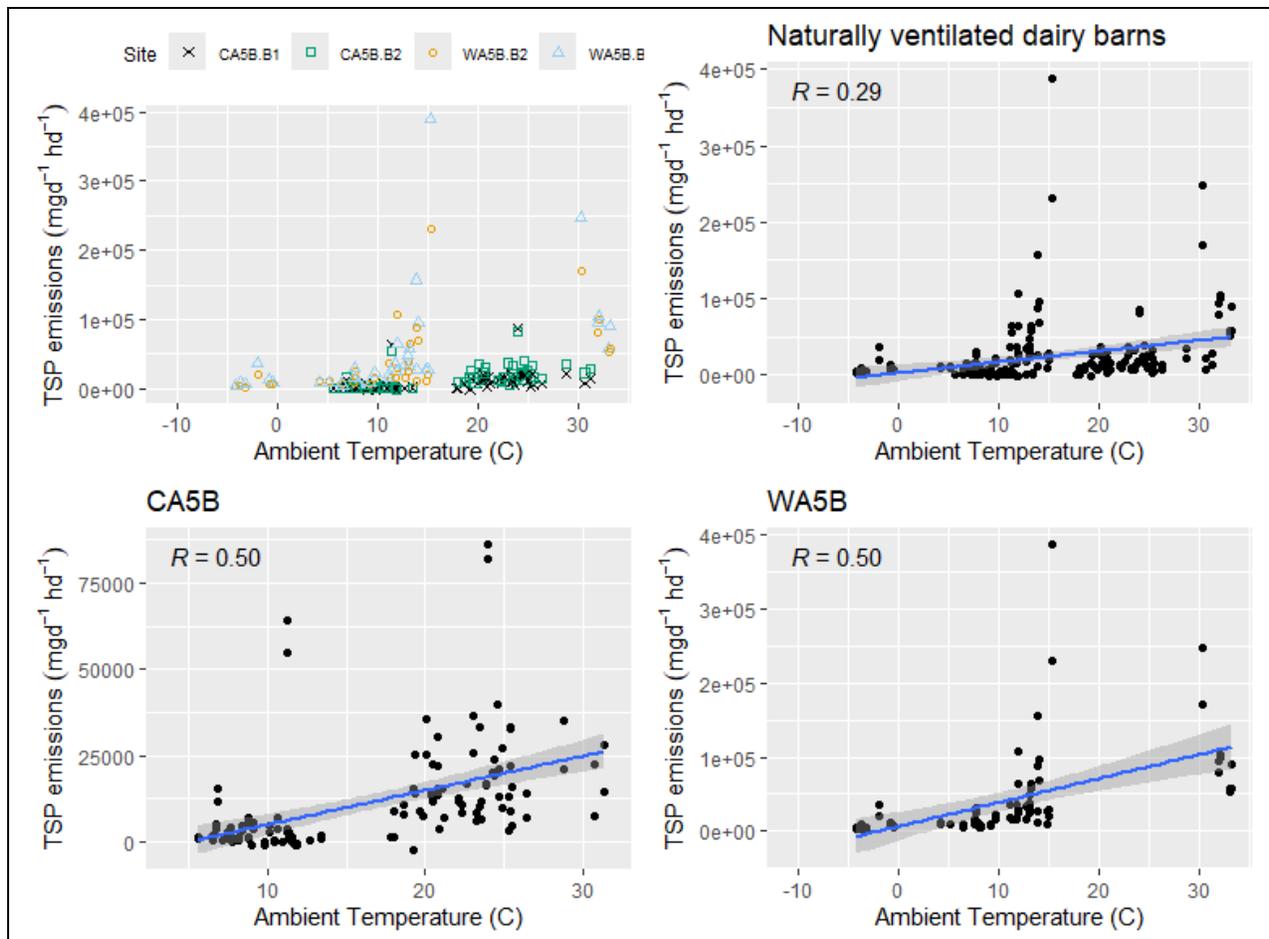


Figure 3.86: Scatter plot of naturally ventilated dairy barns TSP emissions (mg d⁻¹hd⁻¹) versus ambient temperature.

3.2.5.2 Ambient relative humidity

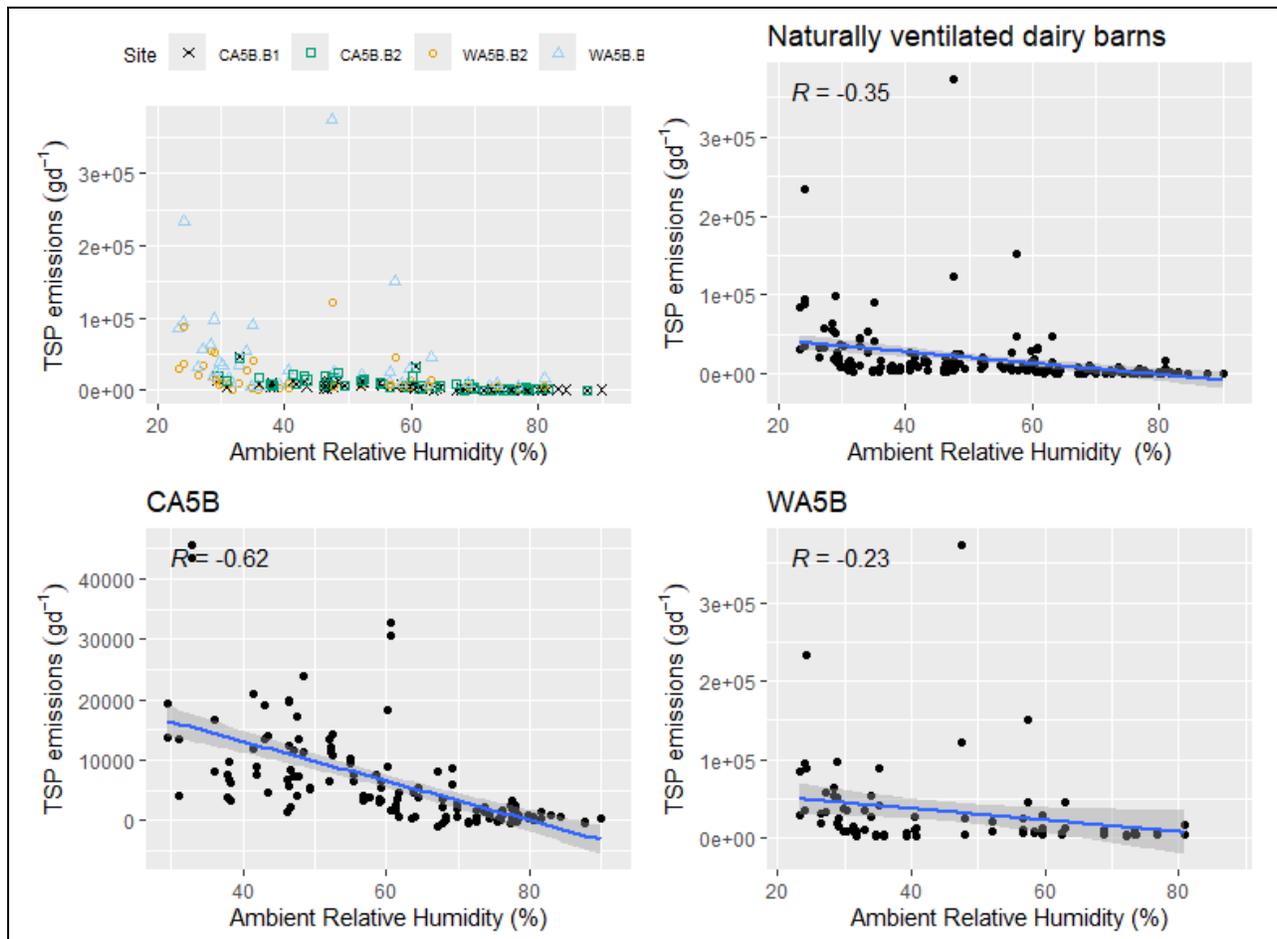


Figure 3.87: Scatter plot of naturally ventilated dairy barns TSP emissions (g d^{-1}) versus ambient relative humidity.

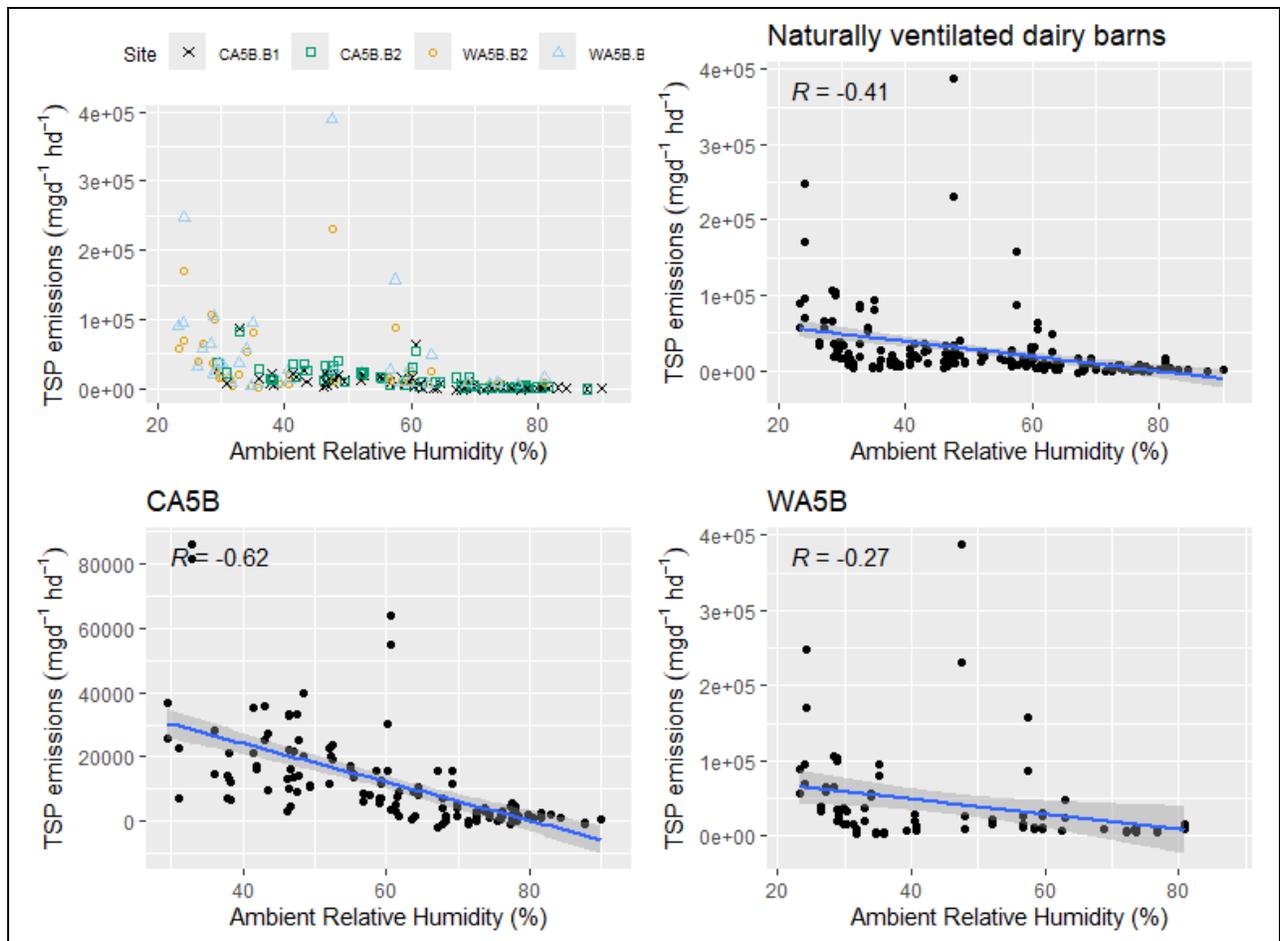


Figure 3.88: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus ambient relative humidity.

3.2.5.3 Air pressure

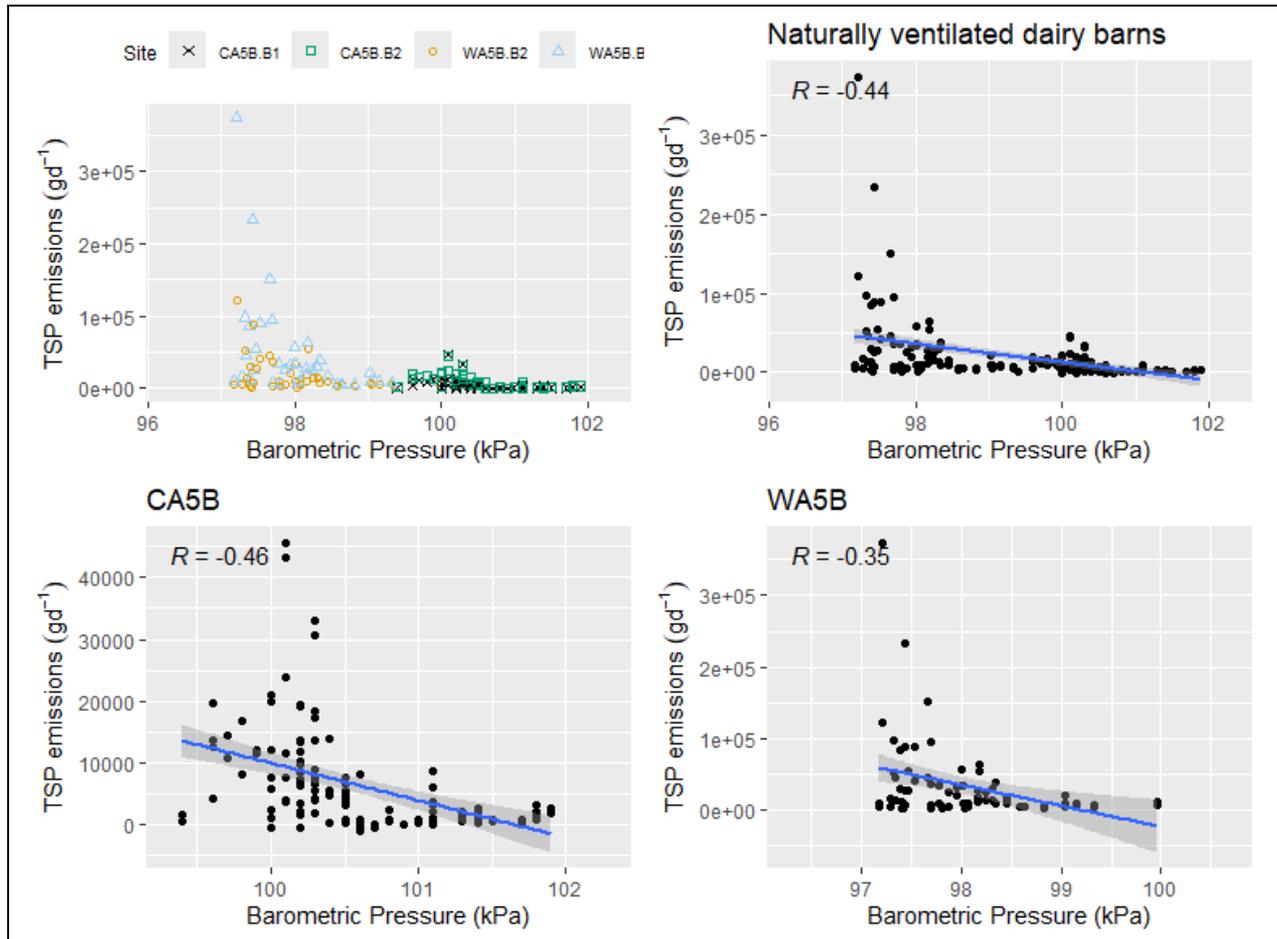


Figure 3.89: Scatter plot of naturally ventilated dairy barns TSP emissions (g d⁻¹) versus air pressure.

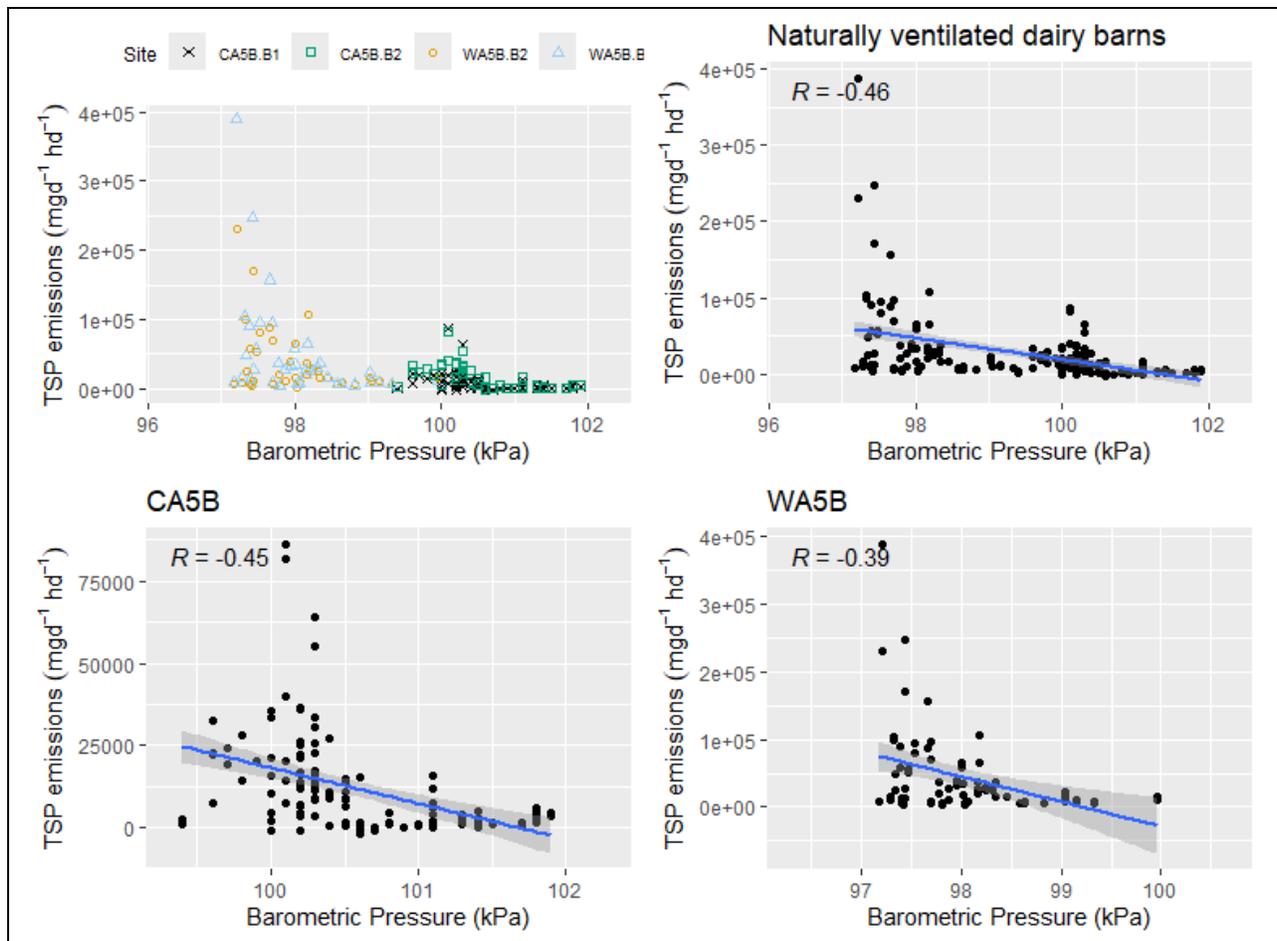


Figure 3.90: Scatter plot of naturally ventilated dairy barns TSP emissions ($\text{mg d}^{-1}\text{hd}^{-1}$) versus air pressure.

4 Lagoons

4.1 Environmental

Table 4.1: Summary of dairy lagoons R² values for environmental parameters.

Emissions	Parameter	R	R ²	Strength
NH ₃ (kgd ⁻¹)	Lagoon Temperature (°C)	0.64	0.41	moderate
H ₂ S (gd ⁻¹)	Lagoon Temperature (°C)	-0.43	0.18	slight or weak
NH ₃ (kgd ⁻¹ m ⁻²)	Lagoon Temperature (°C)	0.58	0.33	modest
H ₂ S (gd ⁻¹ m ⁻²)	Lagoon Temperature (°C)	-0.43	0.18	slight or weak
NH ₃ (kgd ⁻¹)	Oxidation reduction potential (mV)	0.28	0.08	slight or weak
H ₂ S (gd ⁻¹)	Oxidation reduction potential (mV)	0.22	0.05	slight or weak
NH ₃ (kgd ⁻¹ m ⁻²)	Oxidation reduction potential (mV)	0.26	0.07	slight or weak
H ₂ S (gd ⁻¹ m ⁻²)	Oxidation reduction potential (mV)	0.22	0.05	slight or weak
NH ₃ (kgd ⁻¹)	pH	-0.19	0.04	slight or weak
H ₂ S (gd ⁻¹)	pH	0.15	0.02	slight or weak
NH ₃ (kgd ⁻¹ m ⁻²)	pH	-0.24	0.06	slight or weak
H ₂ S (gd ⁻¹ m ⁻²)	pH	0.15	0.02	slight or weak

4.1.1 Ammonia (NH₃)

4.1.1.1 Lagoon temperature

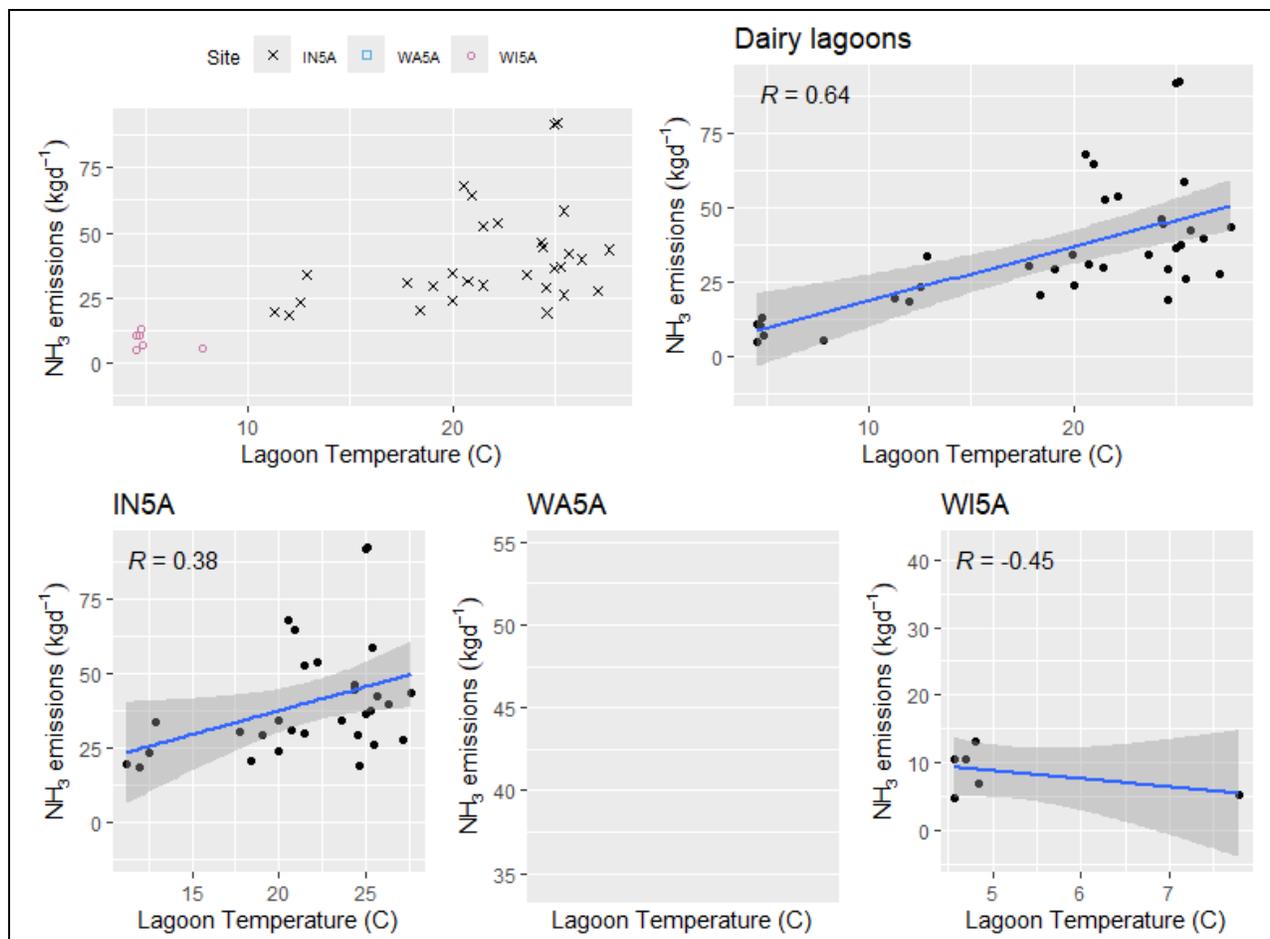
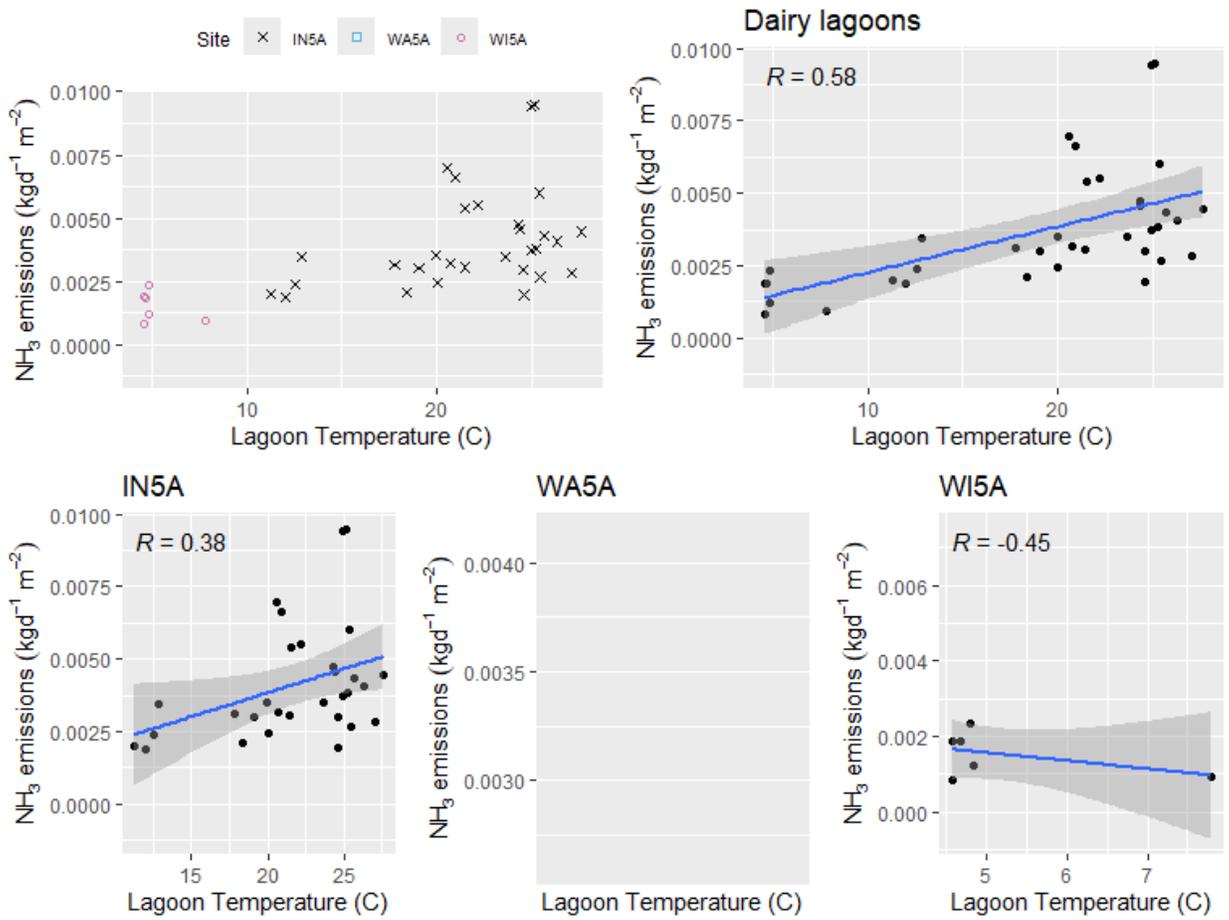


Figure 4.1: Scatter plot of dairy lagoons NH₃ emissions (kg d⁻¹) versus lagoon temperature.



Oxidation reduction potential

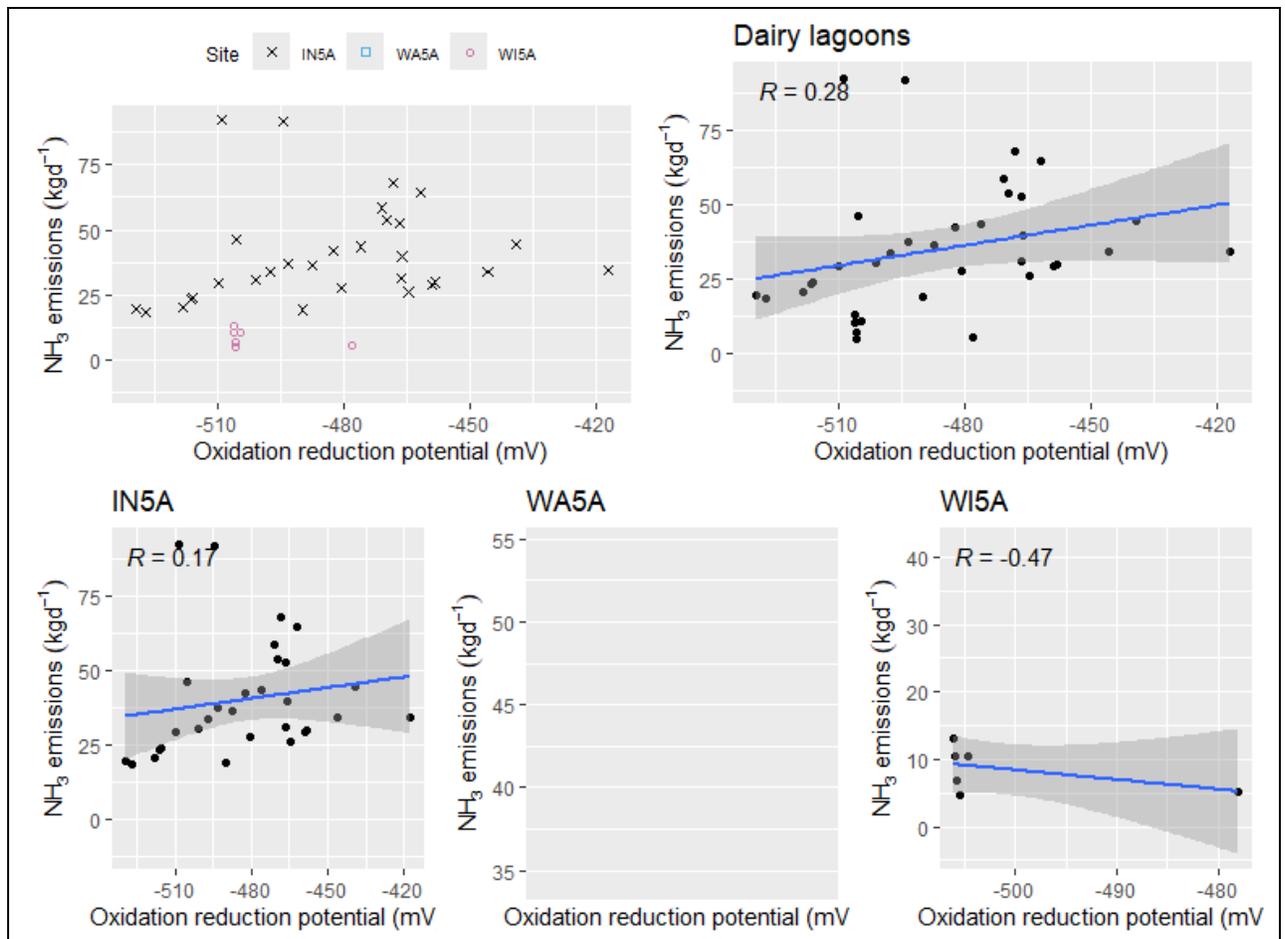


Figure 4.3: Scatter plot of dairy lagoons NH_3 emissions (kg d^{-1}) versus ORP.

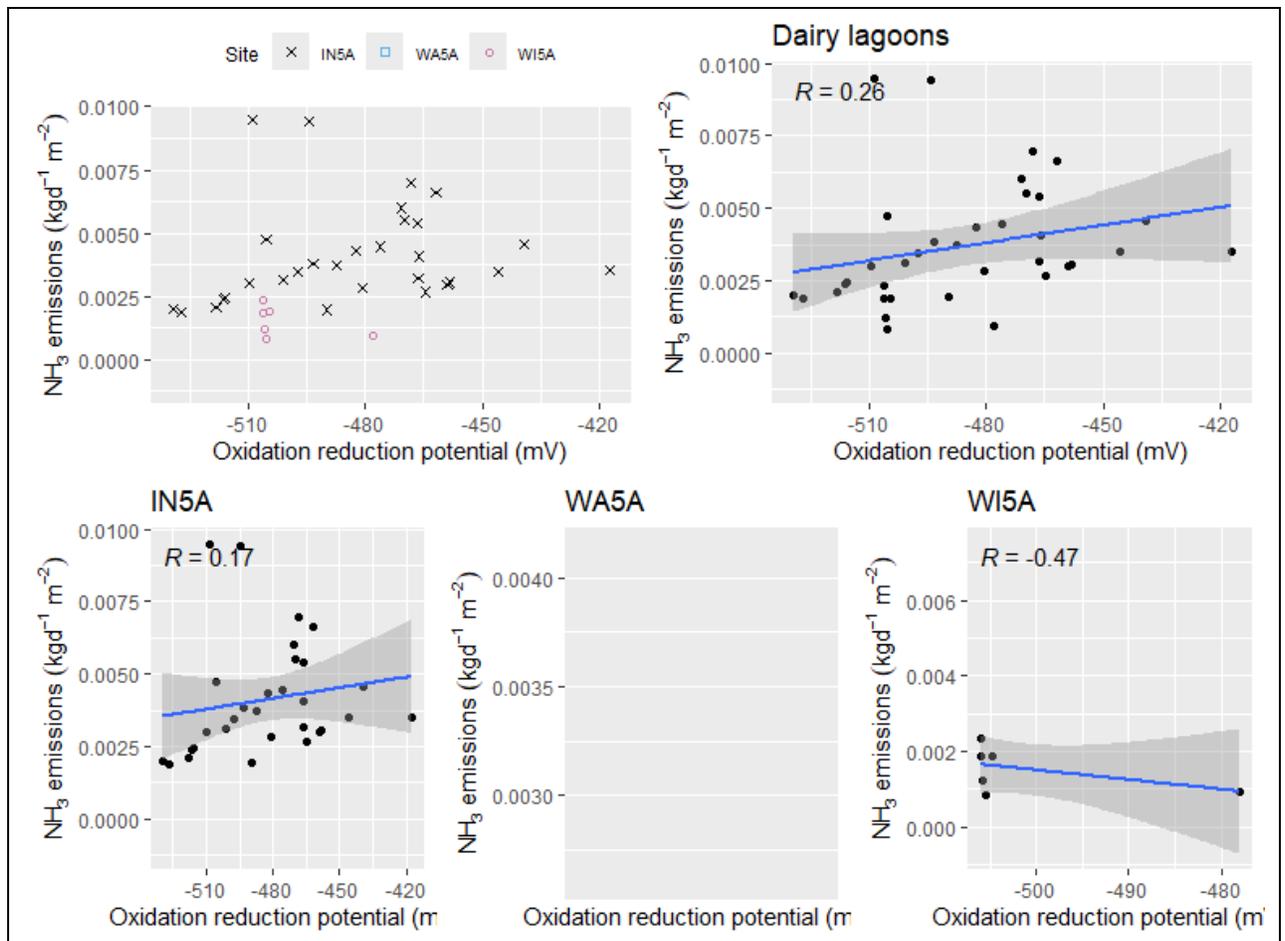


Figure 4.4: Scatter plot of dairy lagoons NH_3 emissions ($\text{g d}^{-1} \text{m}^{-2}$) versus ORP.

4.1.1.2 pH

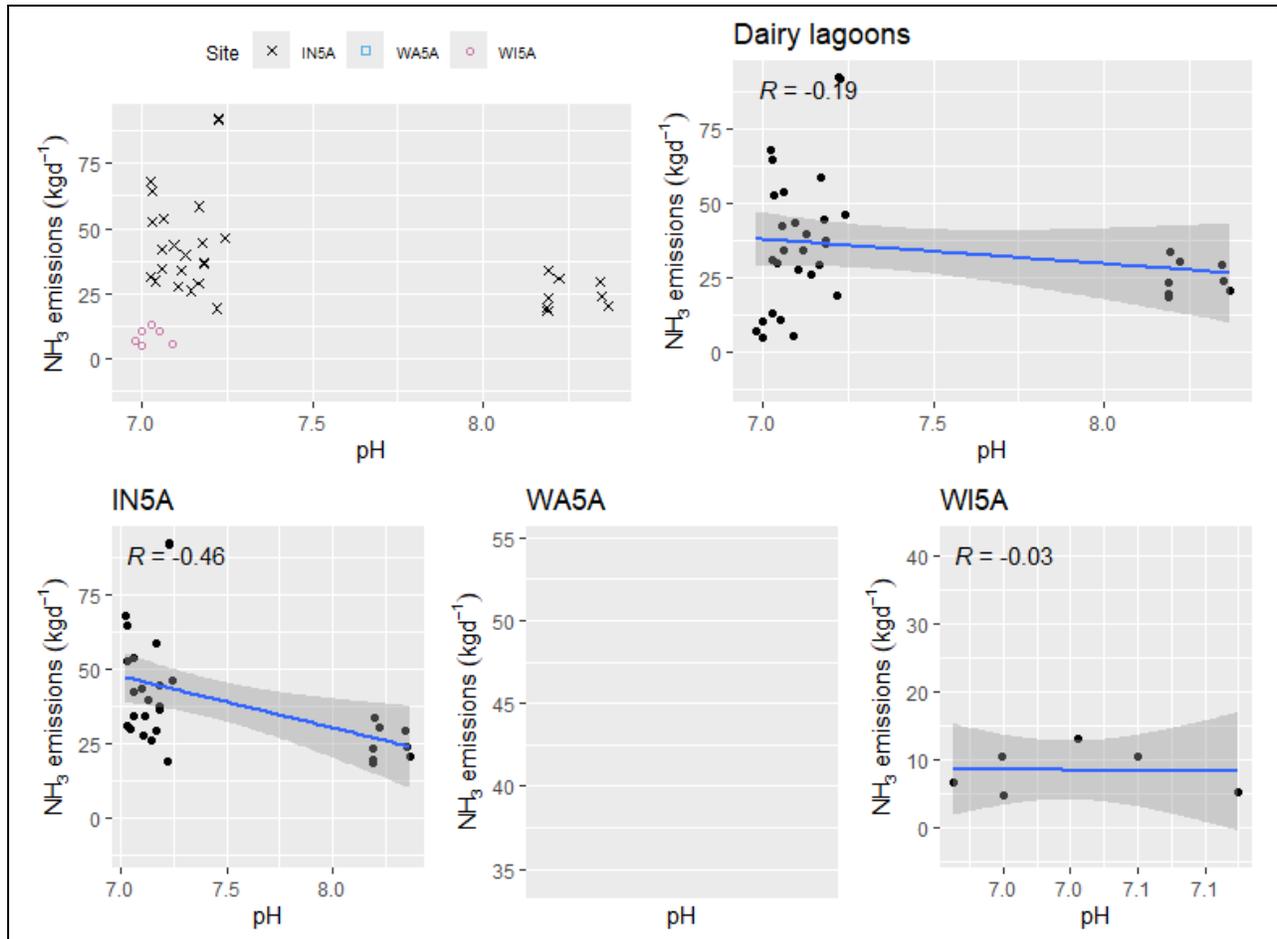


Figure 4.5: Scatter plot of dairy lagoons NH₃ emissions (kg d⁻¹) versus pH.

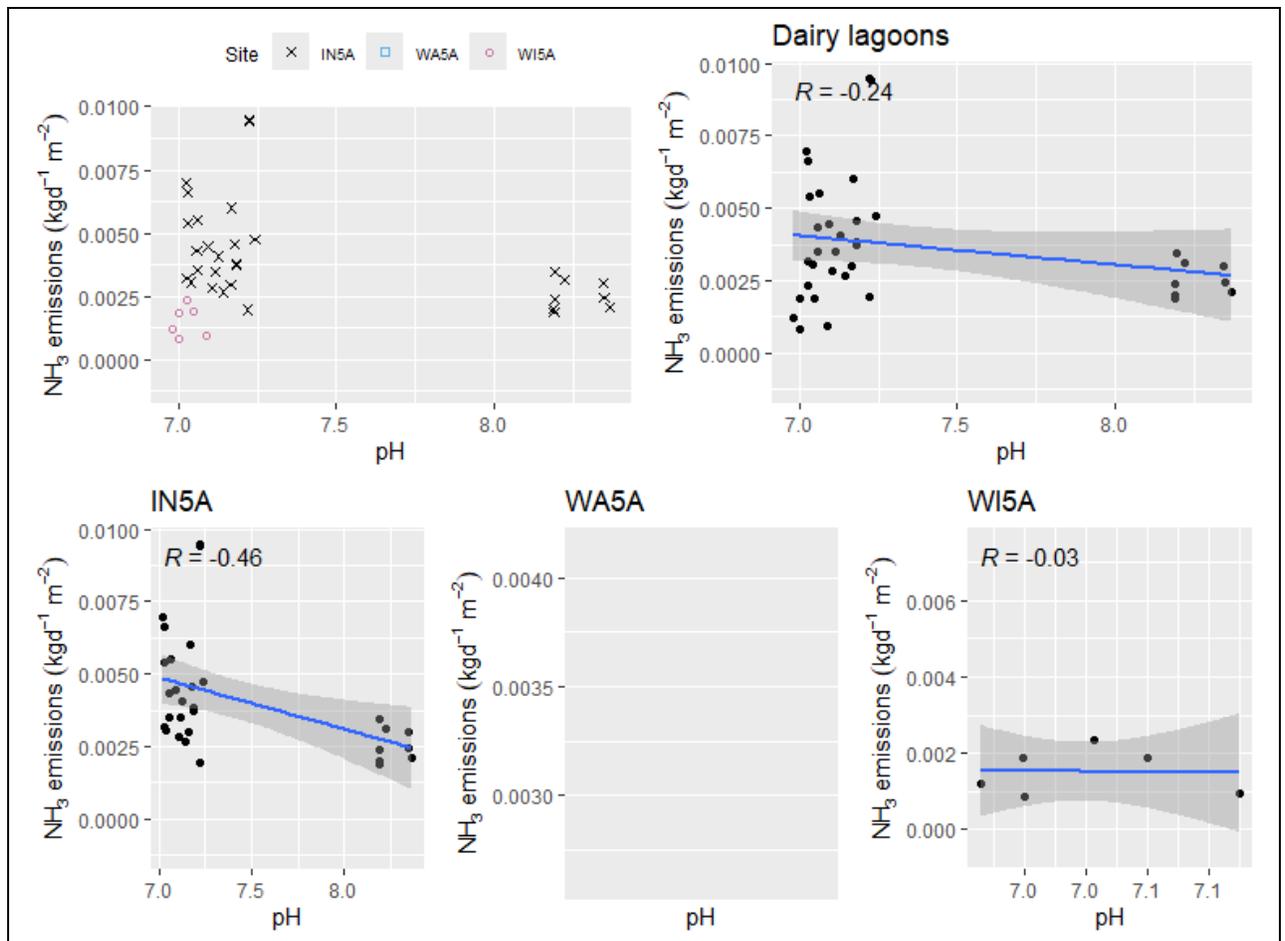


Figure 4.6: Scatter plot of dairy lagoons NH_3 emissions ($\text{kg d}^{-1}\text{m}^{-2}$) versus pH.

4.1.2 Hydrogen Sulfide (H₂S)

4.1.2.1 Lagoon temperature

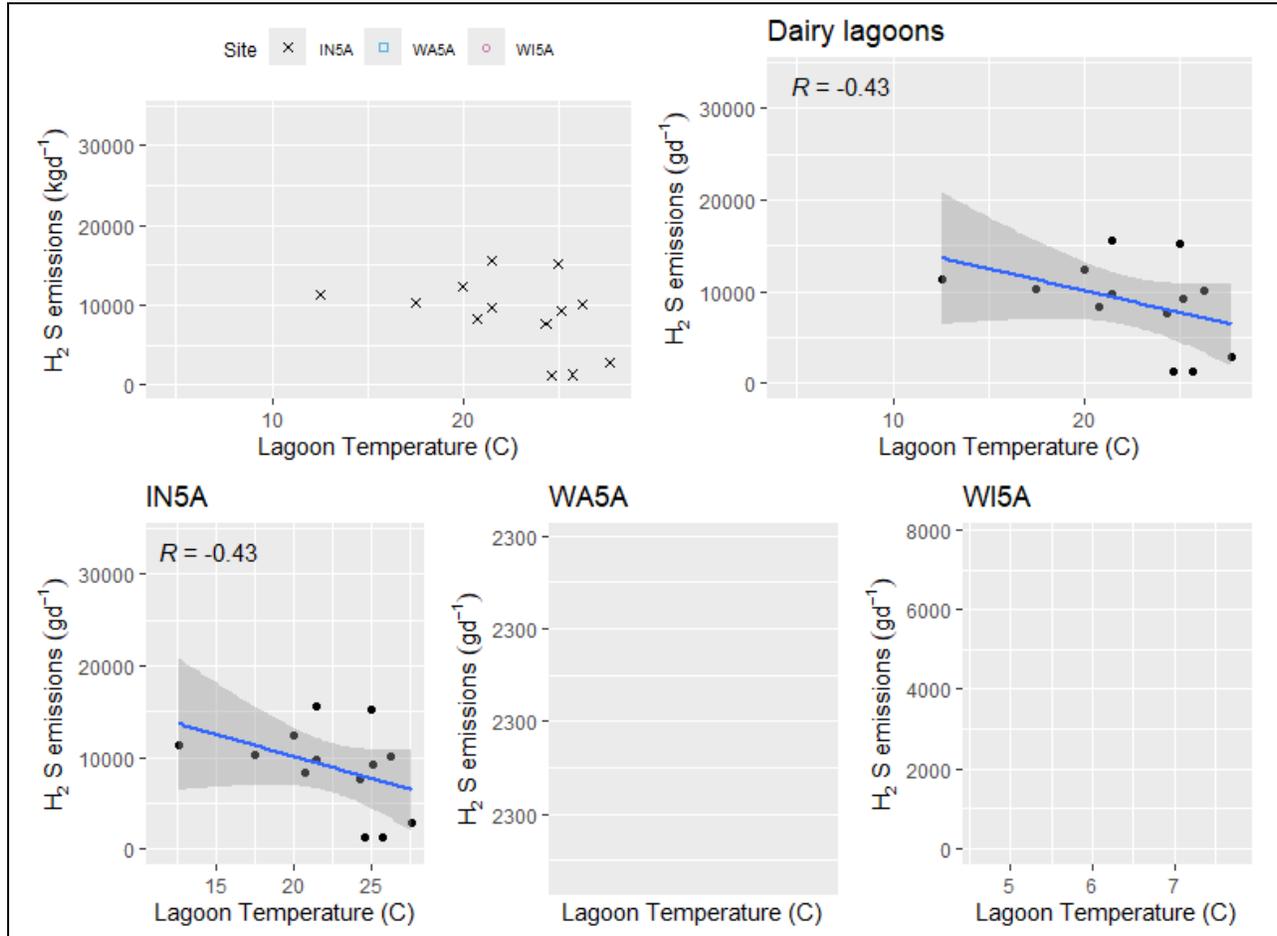
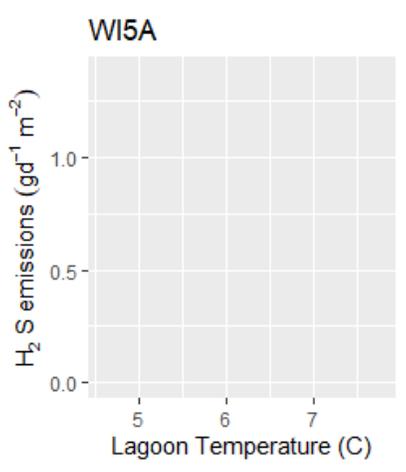
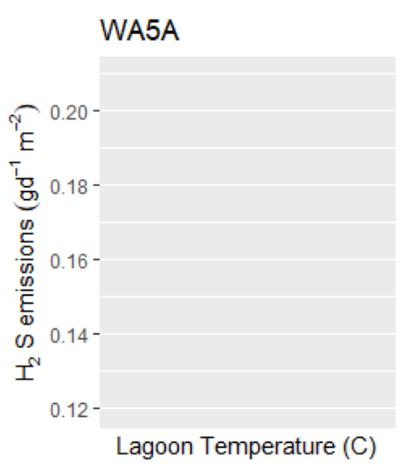
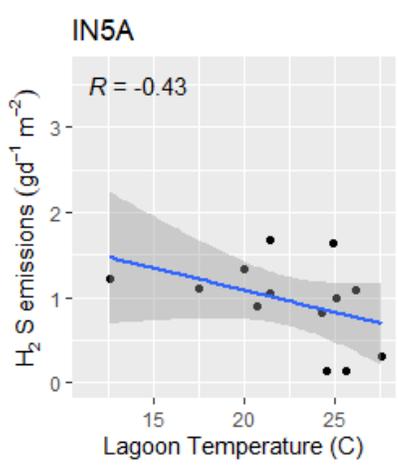
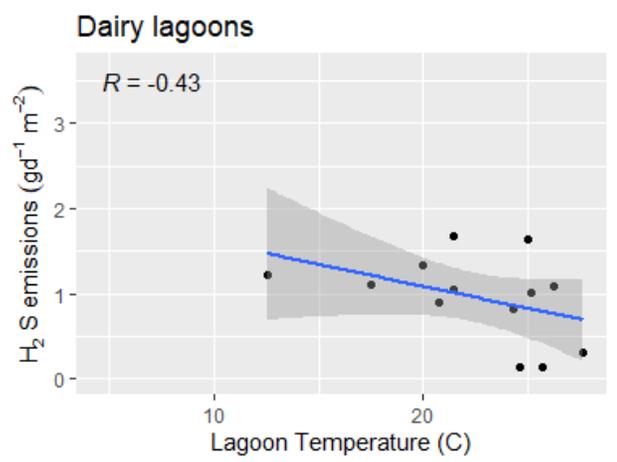
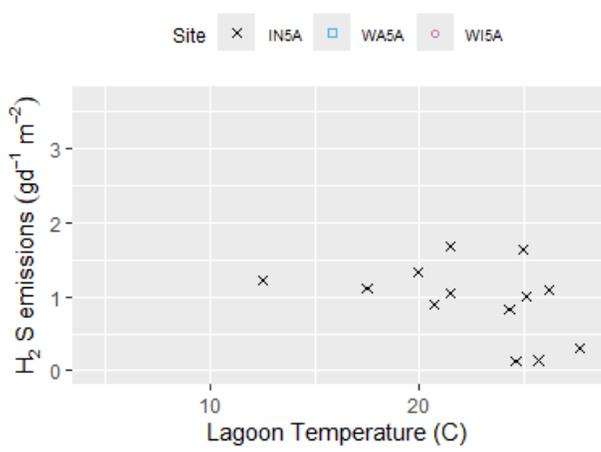


Figure 4.7: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹) versus lagoon temperature.



Oxidation reduction potential

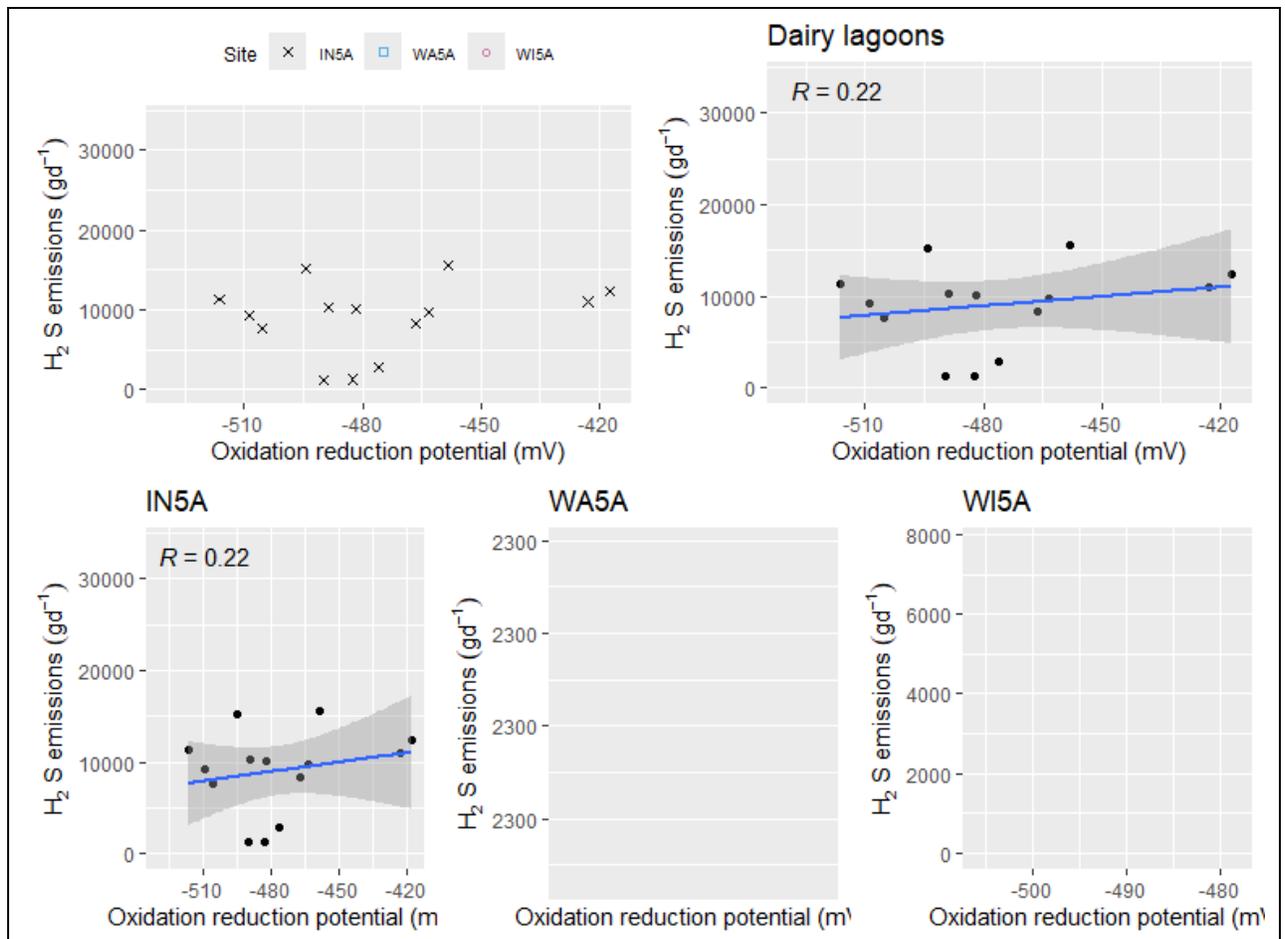


Figure 4.9: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹) versus ORP.

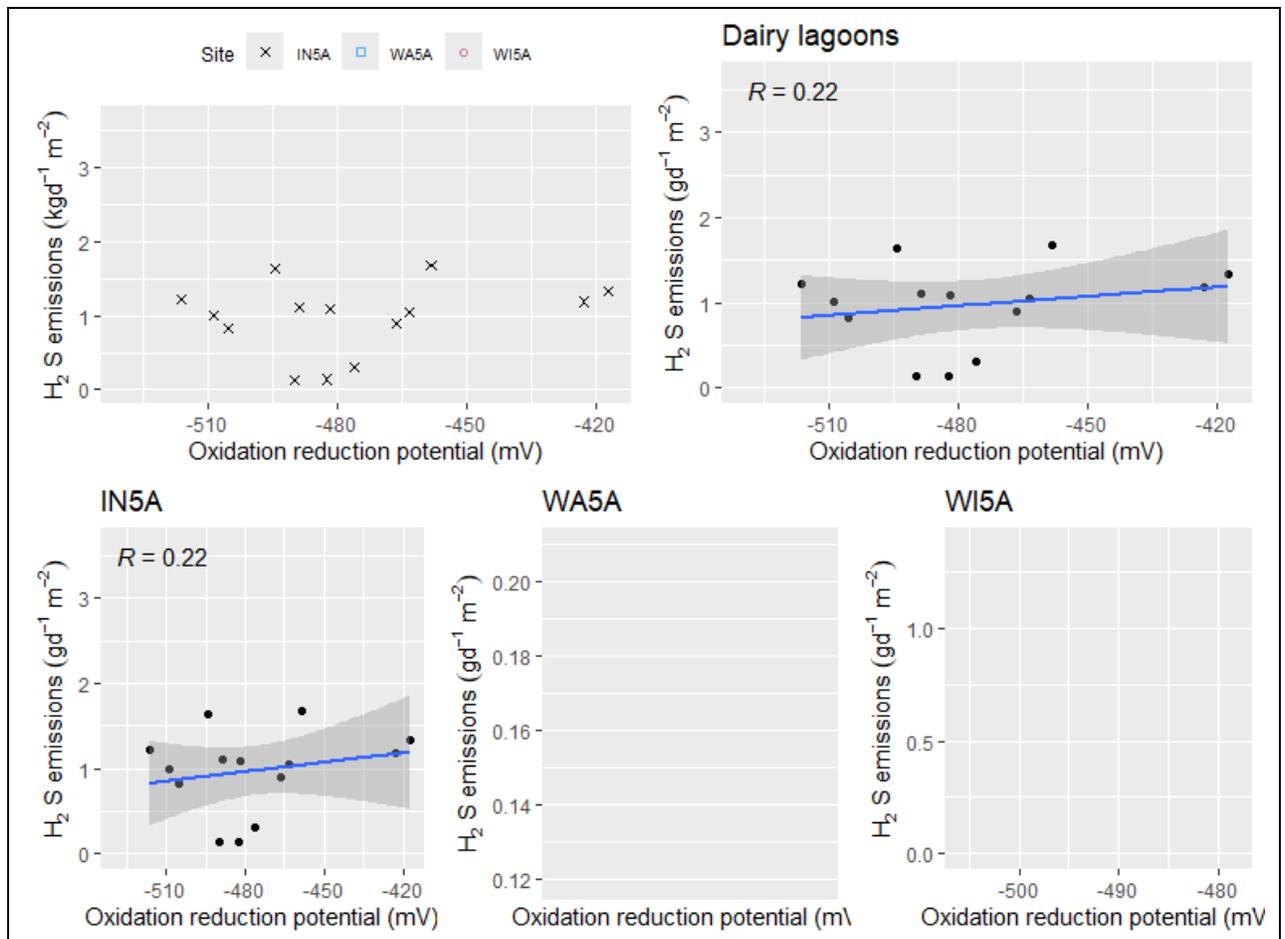


Figure 4.10: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹ m⁻²) versus ORP.

4.1.2.2 pH

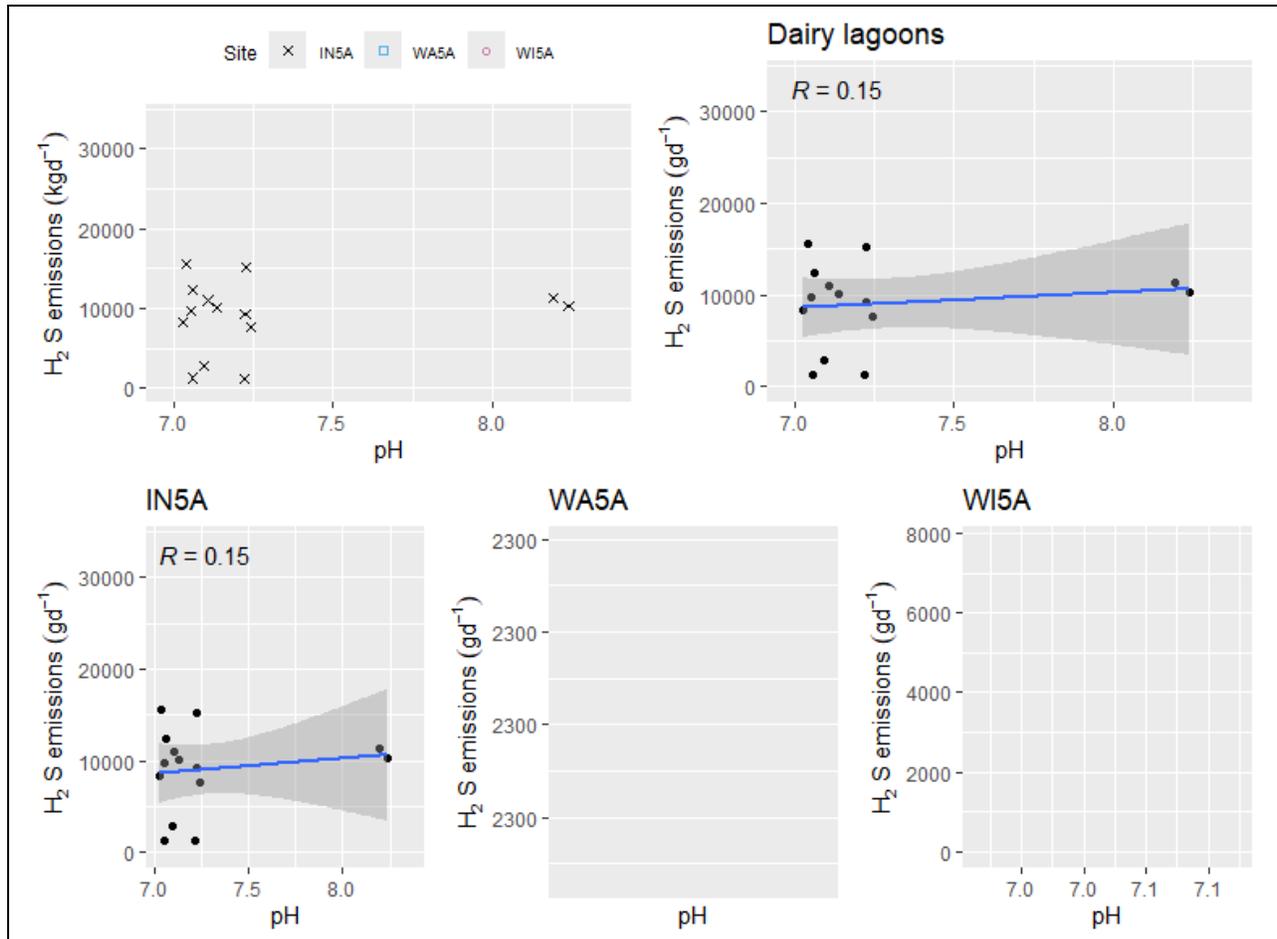


Figure 4.11: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹) versus pH.

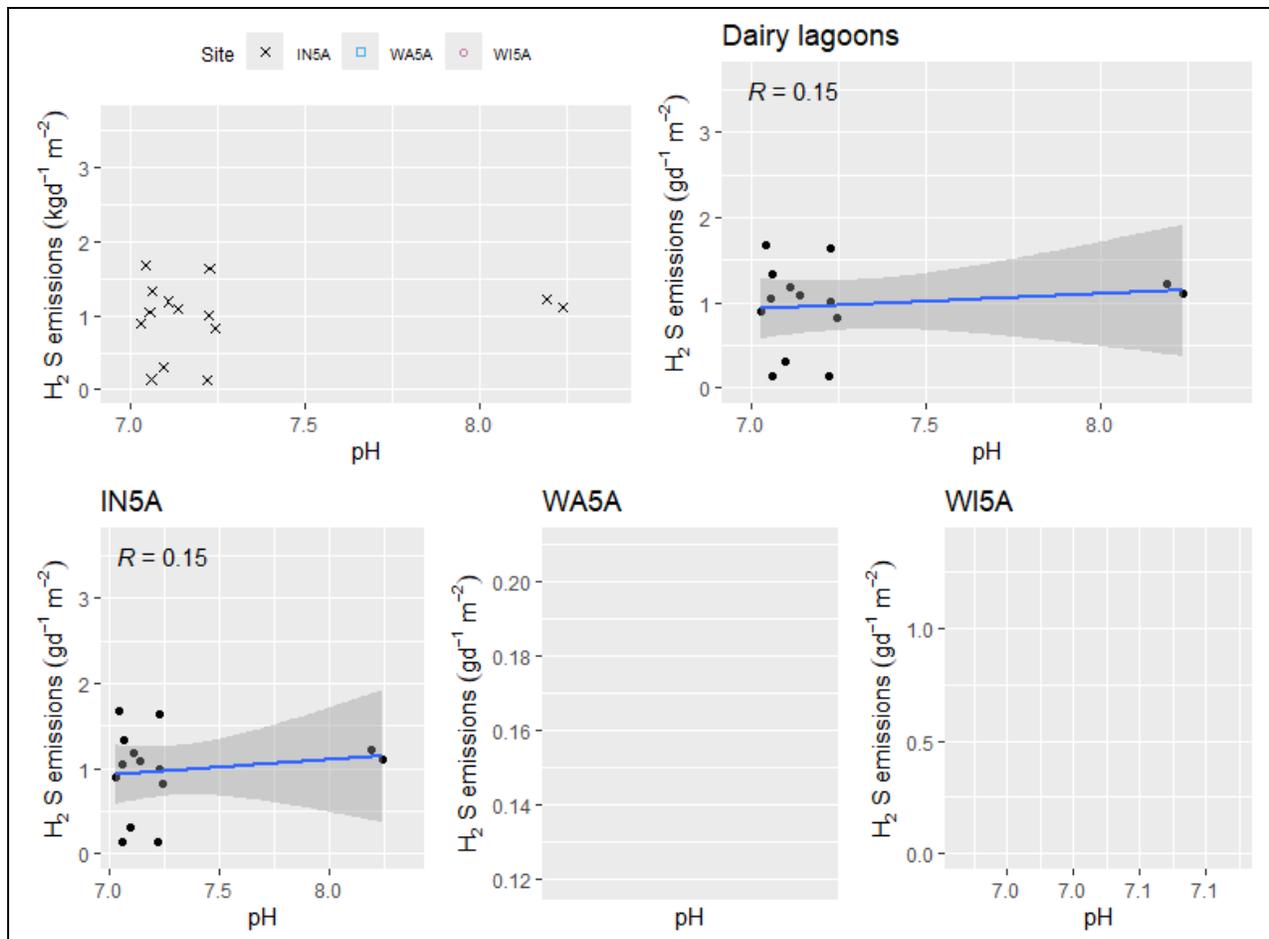


Figure 4.12: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹ m⁻²) versus pH.

4.2 Ambient

Table 4.2: Summary of dairy lagoons R² values for ambient parameters.

Emission	Parameters	R	R ²	Strength
NH ₃ (kgd ⁻¹)	Ambient Temperature (C)	0.83	0.69	moderately strong
H ₂ S (gd ⁻¹)	Ambient Temperature (C)	0.57	0.32	modest
NH ₃ (kgd ⁻¹ m ⁻²)	Ambient Temperature (C)	0.78	0.62	moderately strong
H ₂ S (gd ⁻¹ m ⁻²)	Ambient Temperature (C)	0.57	0.32	modest
NH ₃ (kgd ⁻¹)	Ambient Relative humidity (%)	-0.32	0.1	slight or weak
H ₂ S (gd ⁻¹)	Ambient Relative humidity (%)	-0.24	0.06	slight or weak
NH ₃ (kgd ⁻¹ m ⁻²)	Ambient Relative humidity (%)	-0.32	0.1	slight or weak
H ₂ S (gd ⁻¹ m ⁻²)	Ambient Relative humidity (%)	-0.25	0.06	slight or weak
NH ₃ (kgd ⁻¹)	Barometric Pressure (kPa)	-0.05	0	slight or weak
H ₂ S (gd ⁻¹)	Barometric Pressure (kPa)	0.13	0.02	slight or weak
NH ₃ (kgd ⁻¹ m ⁻²)	Barometric Pressure (kPa)	-0.16	0.03	slight or weak
H ₂ S (gd ⁻¹ m ⁻²)	Barometric Pressure (kPa)	0.1	0.01	slight or weak
NH ₃ (kgd ⁻¹)	Wind Speed (ms ⁻¹)	-0.23	0.05	slight or weak
H ₂ S (gd ⁻¹)	Wind Speed (ms ⁻¹)	0.12	0.01	slight or weak
NH ₃ (kgd ⁻¹ m ⁻²)	Wind Speed (ms ⁻¹)	-0.2	0.04	slight or weak
H ₂ S (gd ⁻¹ m ⁻²)	Wind Speed (ms ⁻¹)	0.12	0.02	slight or weak

4.2.1 Ammonia (NH₃)

4.2.1.1 Ambient temperature

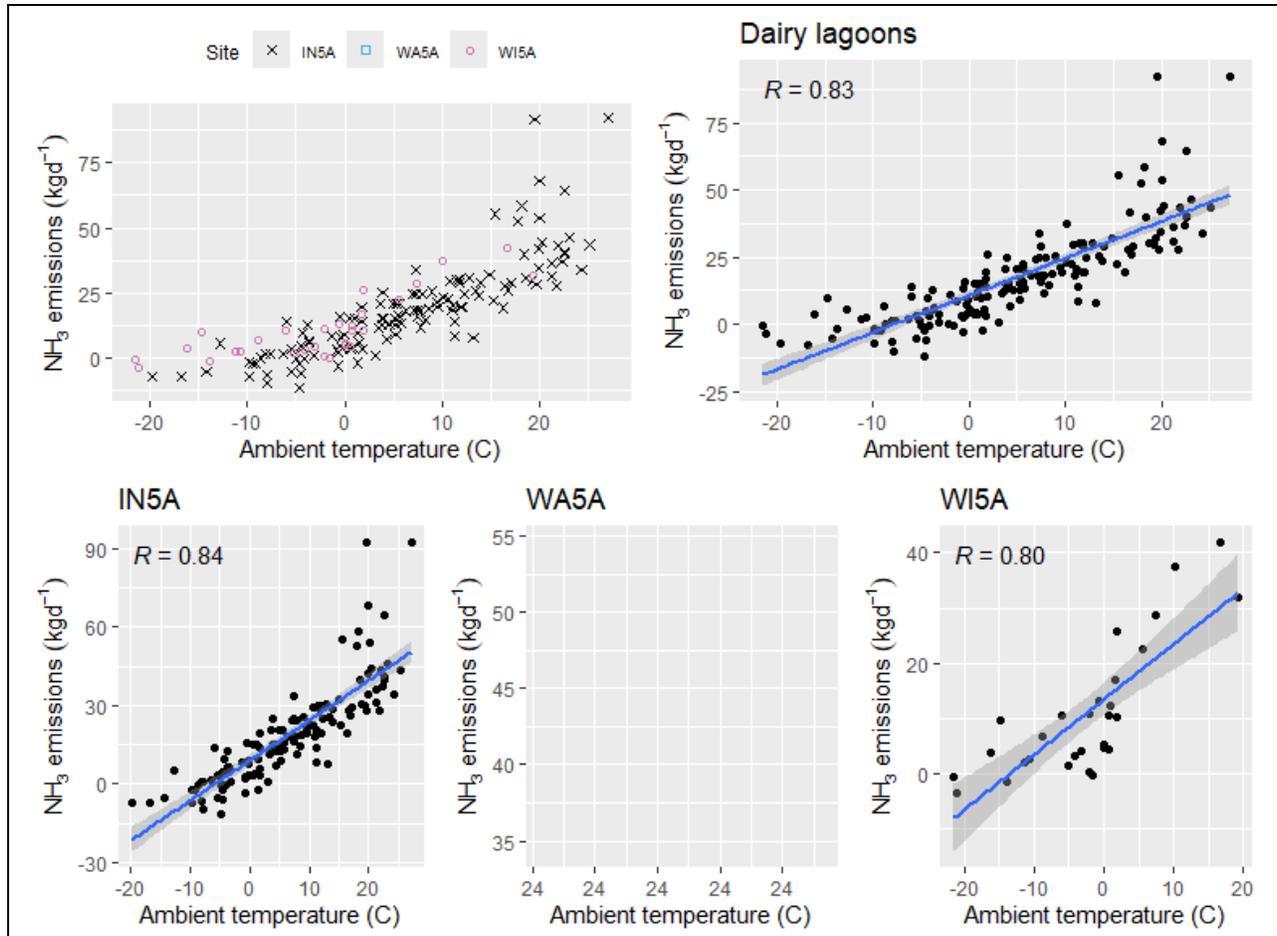
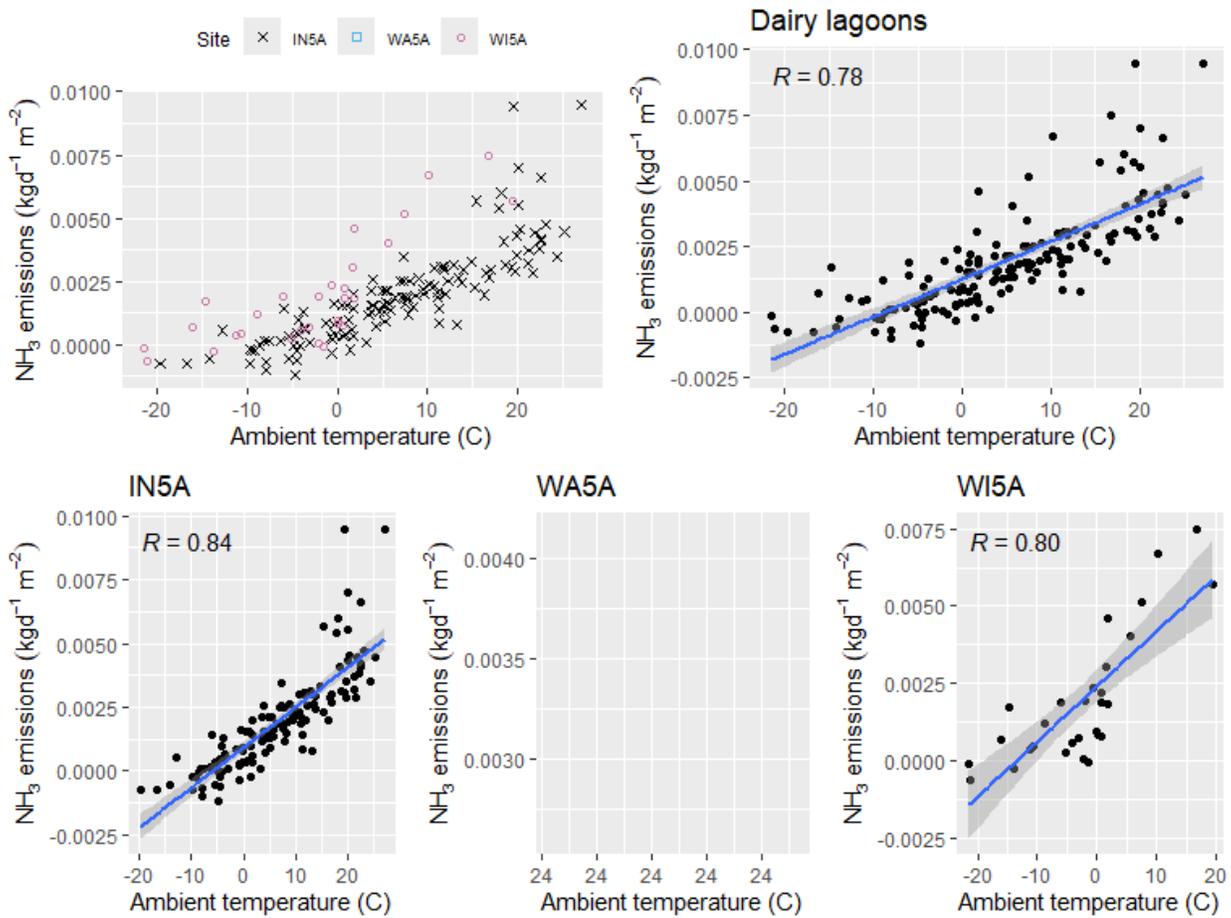


Figure 4.13: Scatter plot of dairy lagoons NH₃ emissions (kg d⁻¹) versus ambient temperature.



Relative humidity

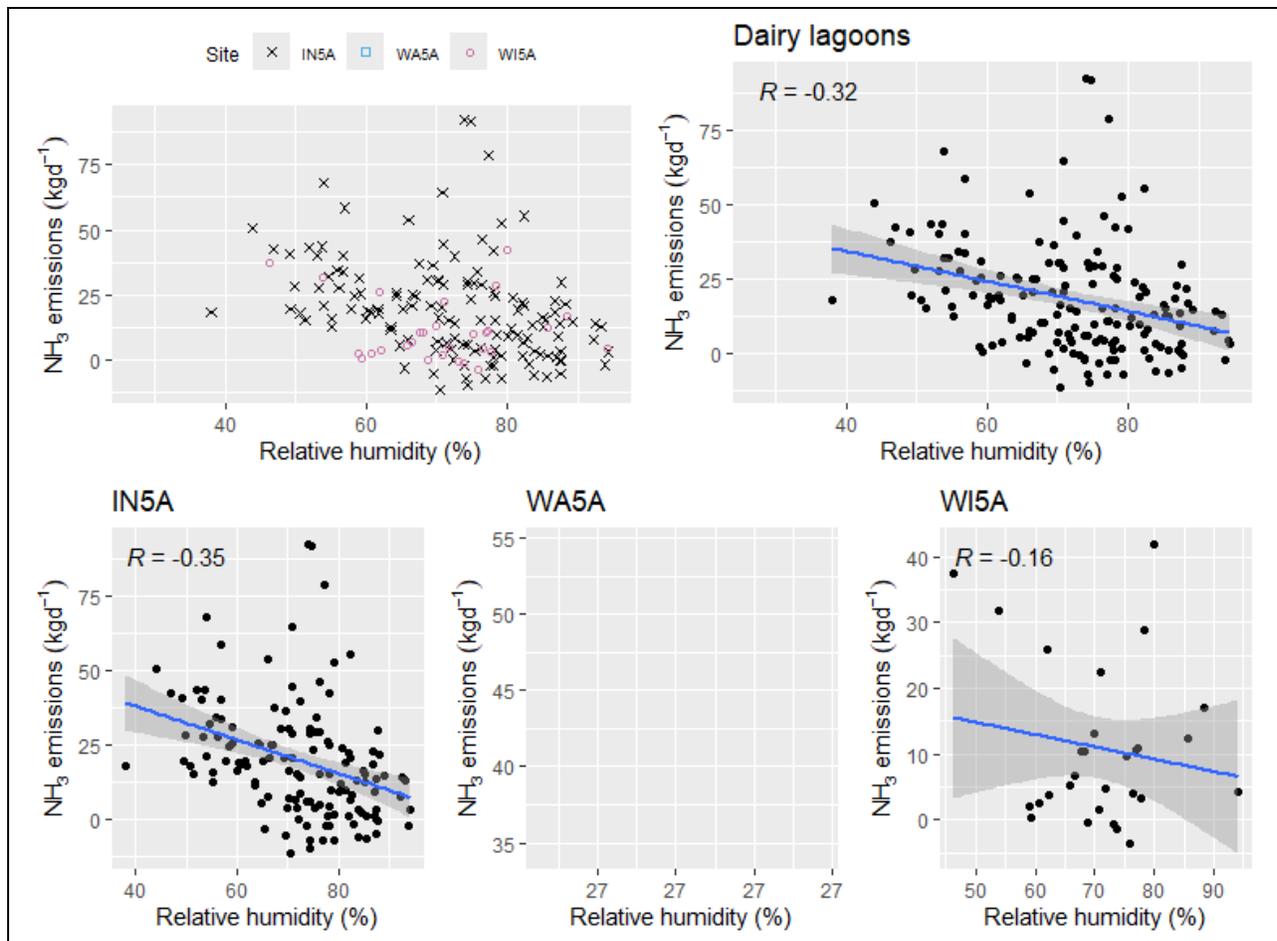


Figure 4.15: Scatter plot of dairy lagoons NH_3 emissions (kg d^{-1}) versus relative humidity.

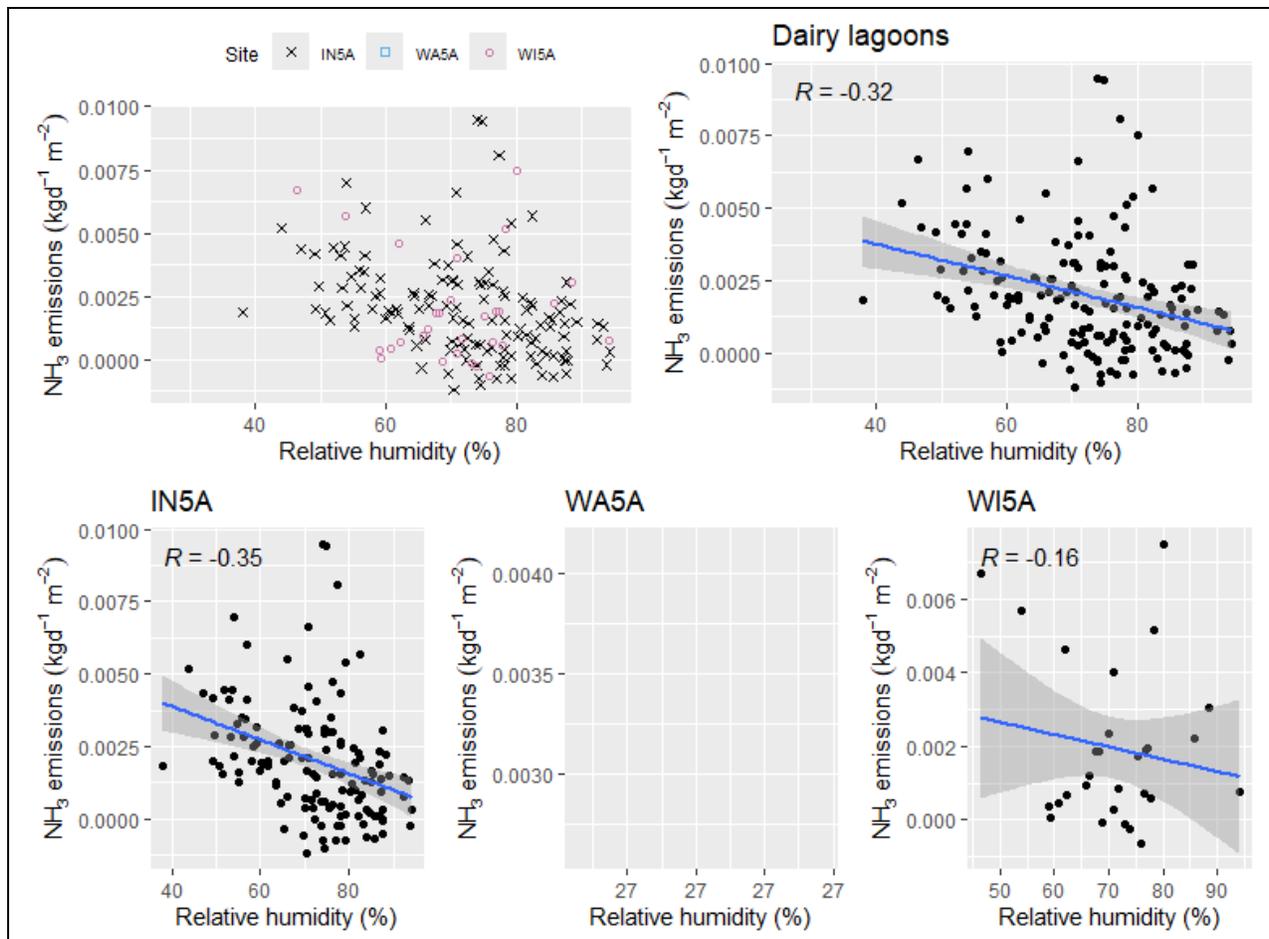


Figure 4.16: Scatter plot of dairy lagoons NH_3 emissions ($\text{g d}^{-1} \text{m}^{-2}$) versus relative humidity.

4.2.1.2 Barometric Pressure

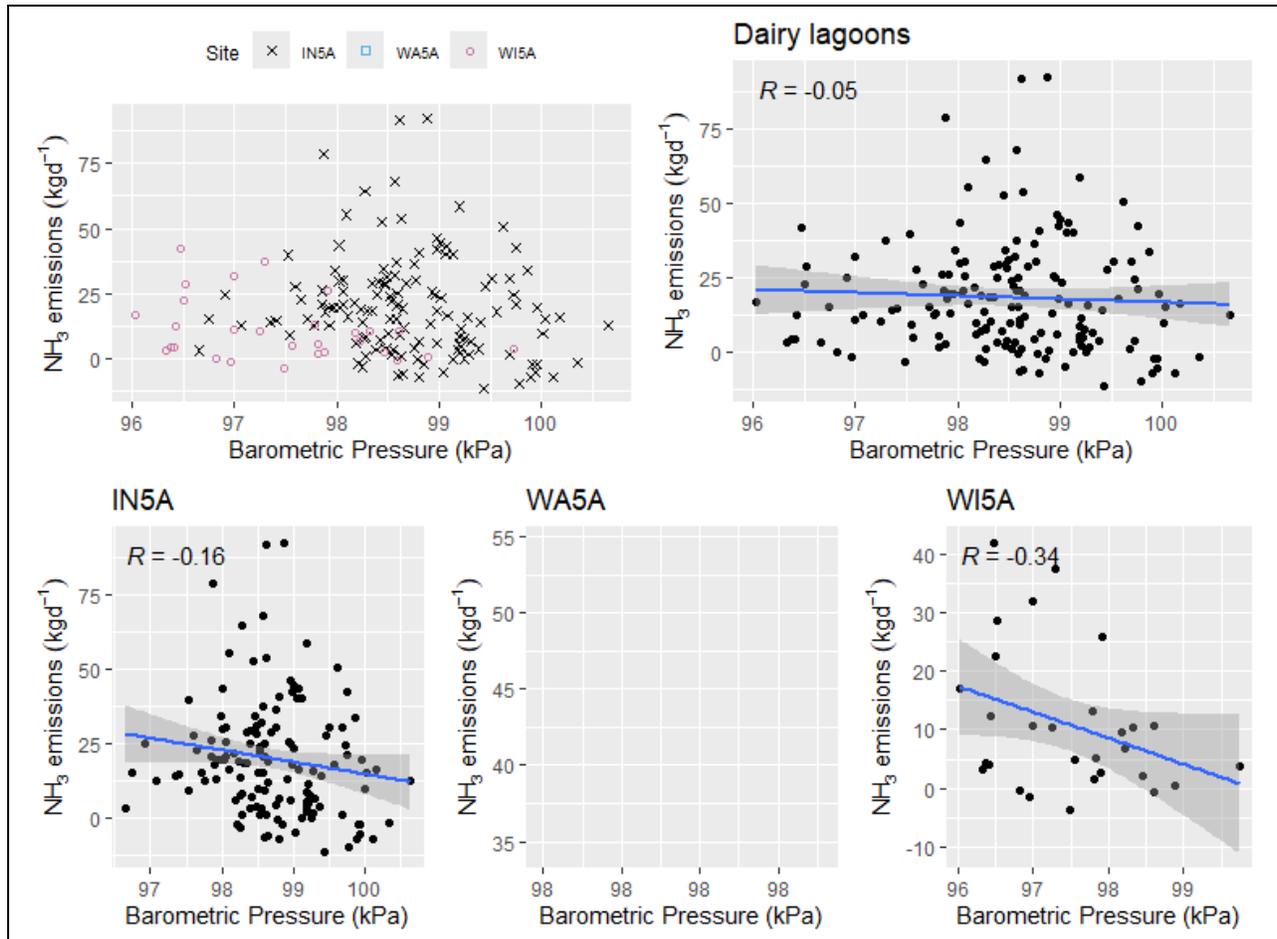


Figure 4.17: Scatter plot of dairy lagoons NH₃ emissions (kg d⁻¹) versus barometric pressure.

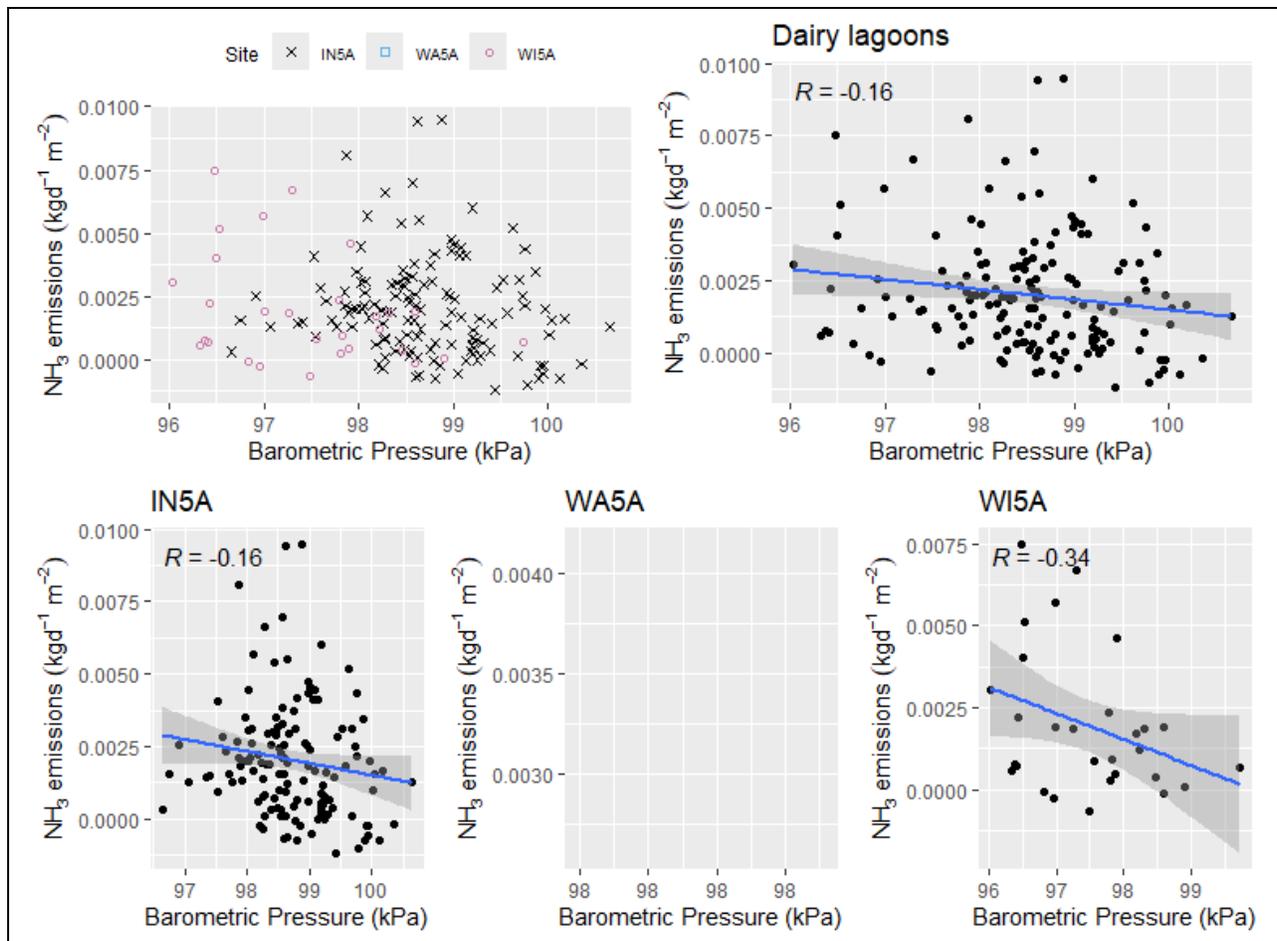


Figure 4.18: Scatter plot of dairy lagoons NH_3 emissions ($\text{kg d}^{-1}\text{m}^{-2}$) versus barometric pressure.

4.2.1.3 Wind speed

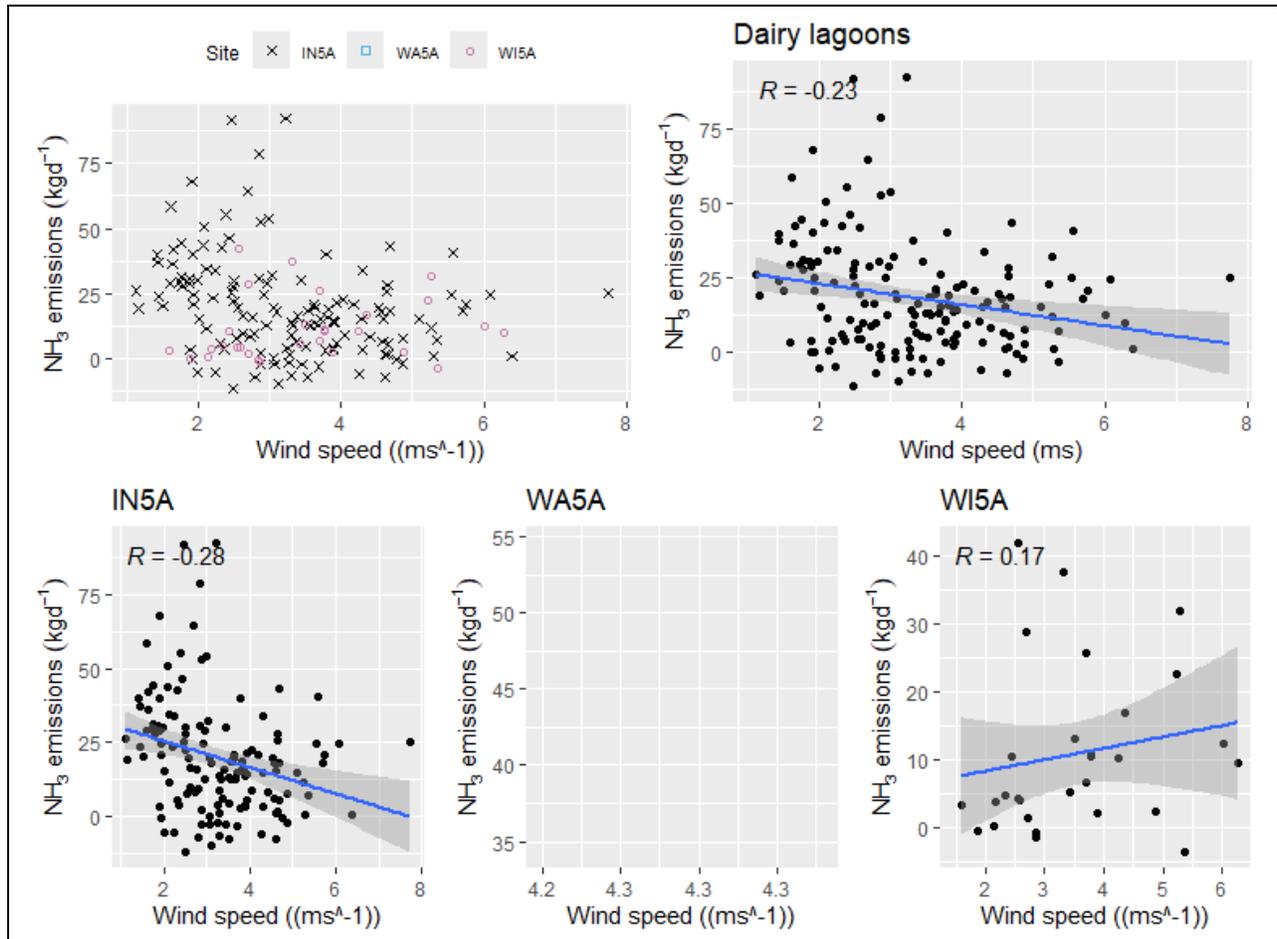


Figure 4.19: Scatter plot of dairy lagoons NH₃ emissions (kg d⁻¹) versus Wind speed.

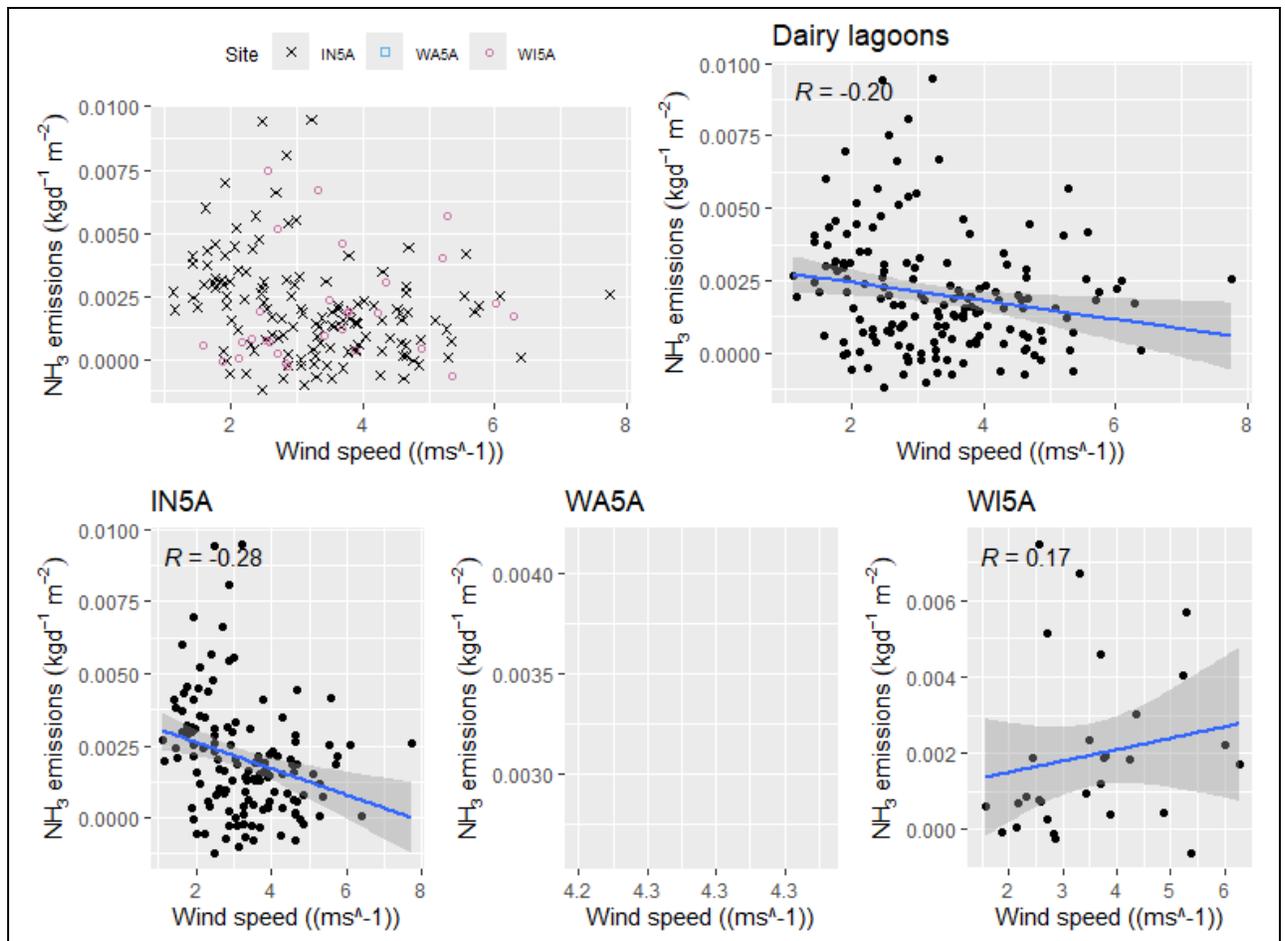


Figure 4.20: Scatter plot of dairy lagoons NH₃ emissions (kg d⁻¹m⁻²) versus Wind speed.

4.2.2 Hydrogen Sulfide (H₂S)

4.2.2.1 Ambient temperature

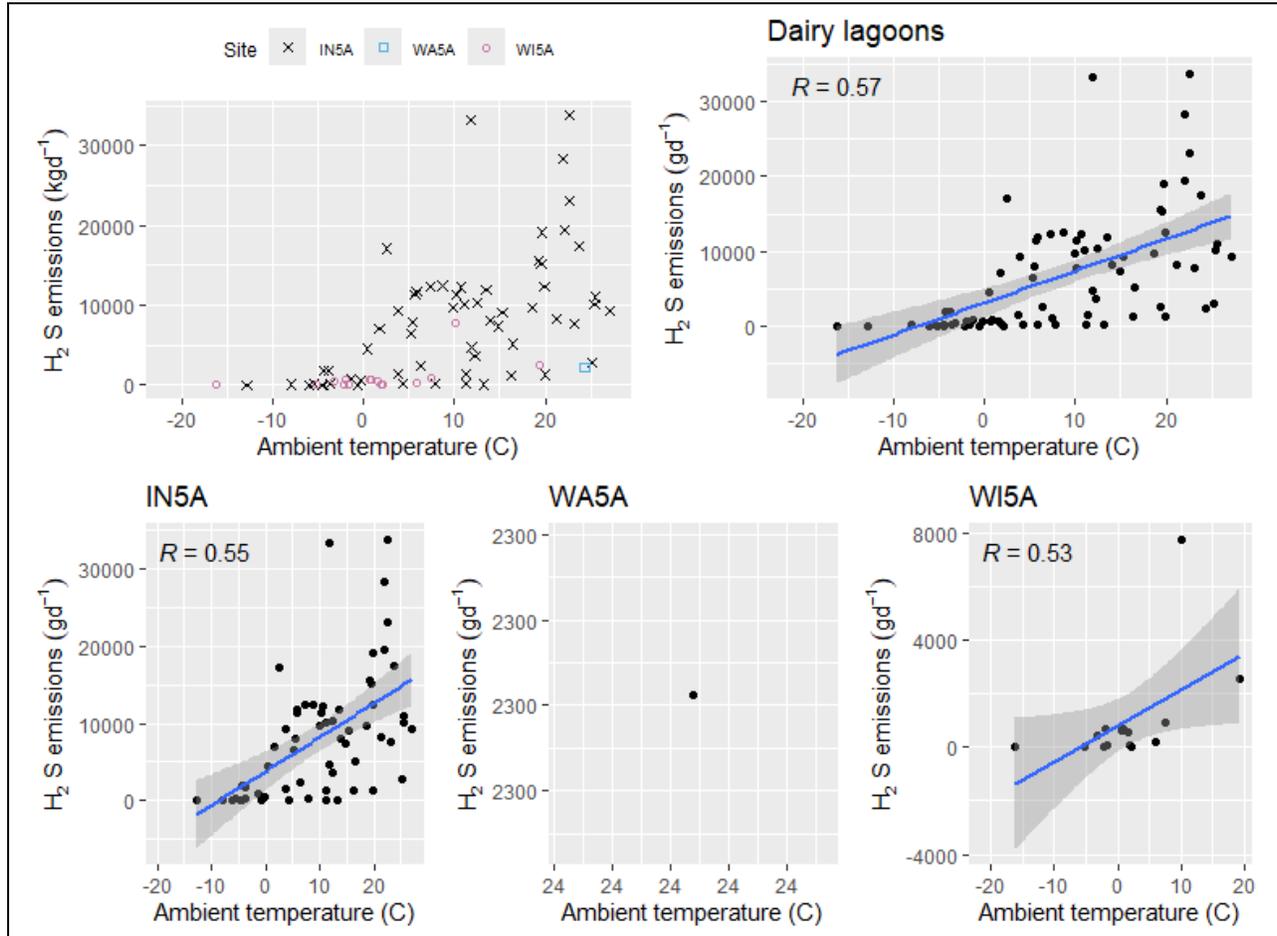
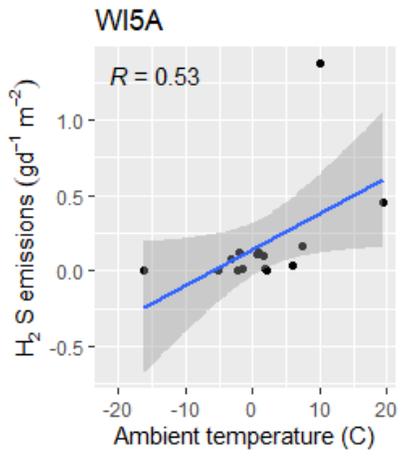
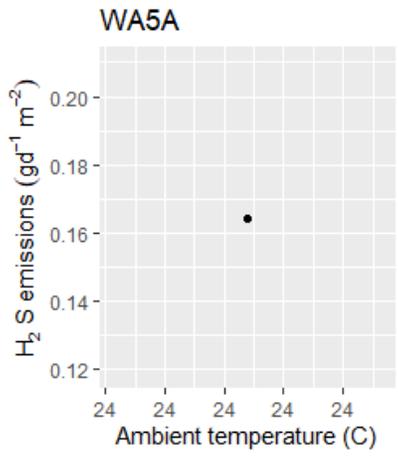
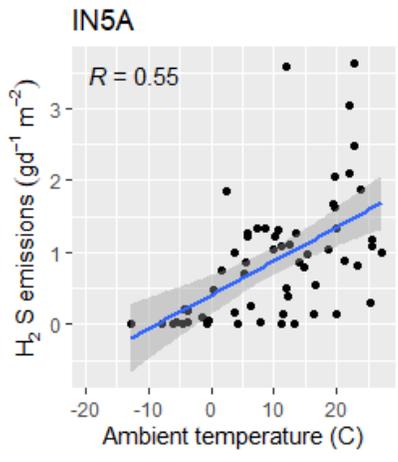
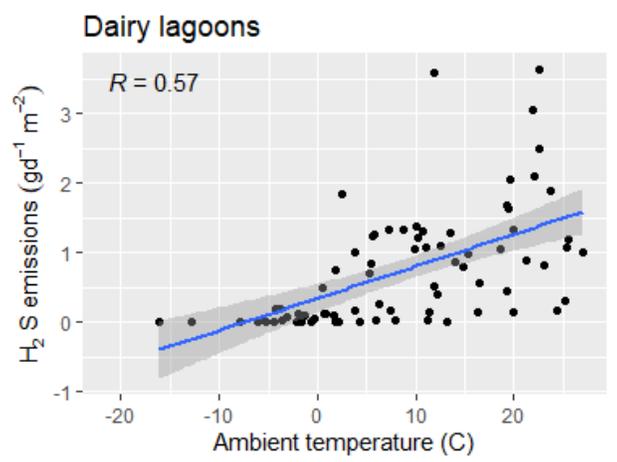
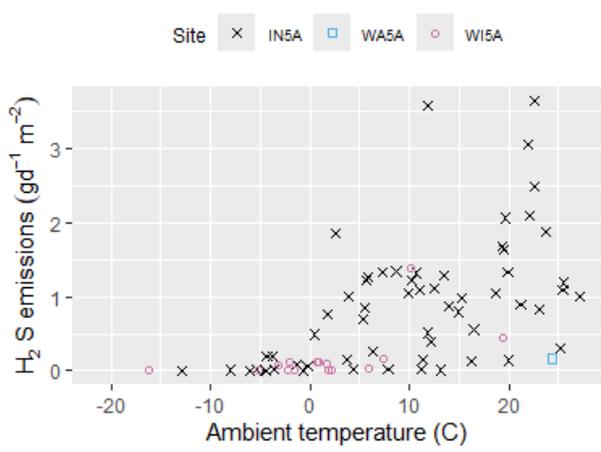


Figure 4.21: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹) versus ambient temperature.



Relative humidity

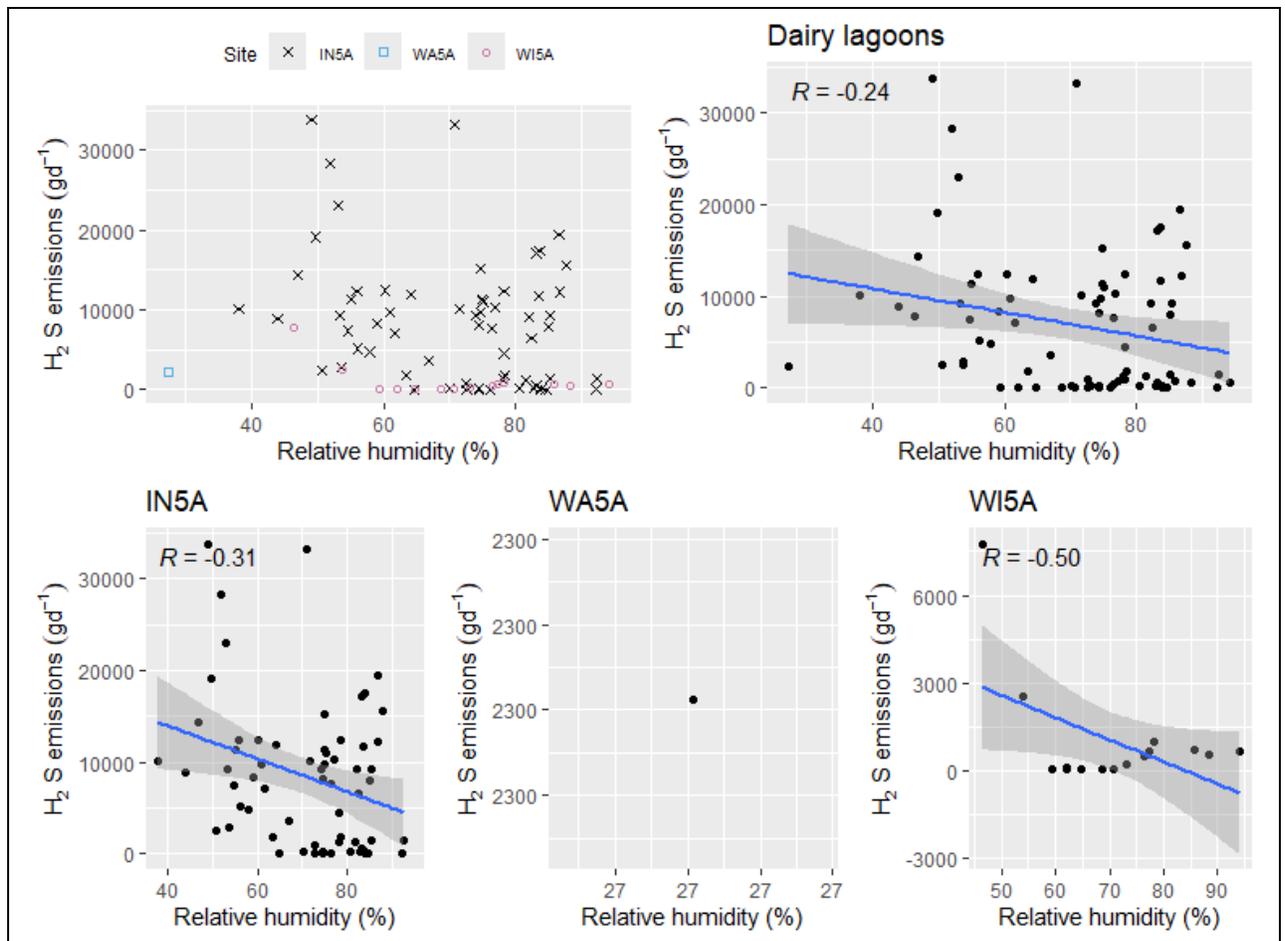


Figure 4.23: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹) versus relative humidity.

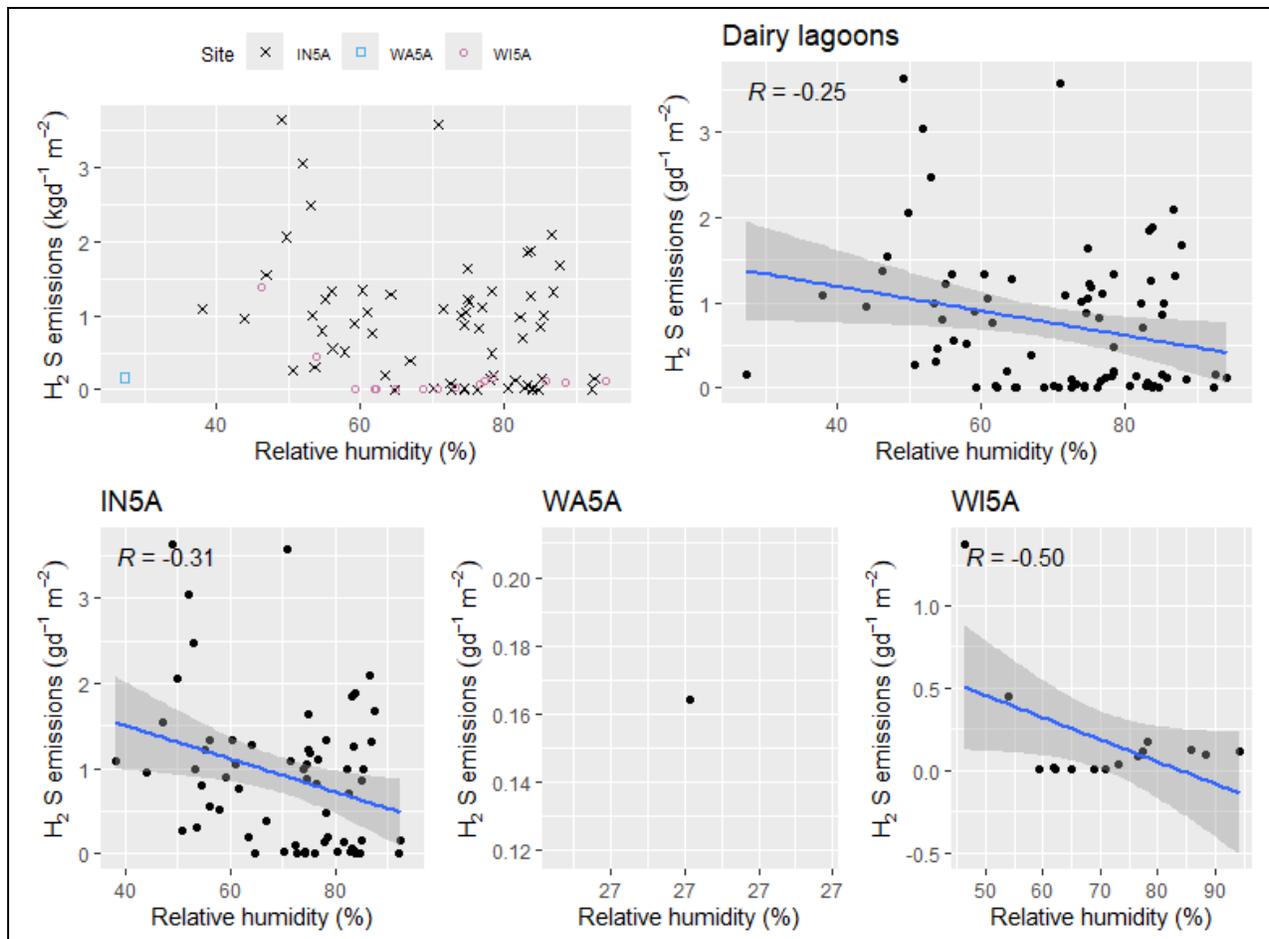


Figure 4.24: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹ m⁻²) versus relative humidity.

4.2.2.2 Barometric Pressure

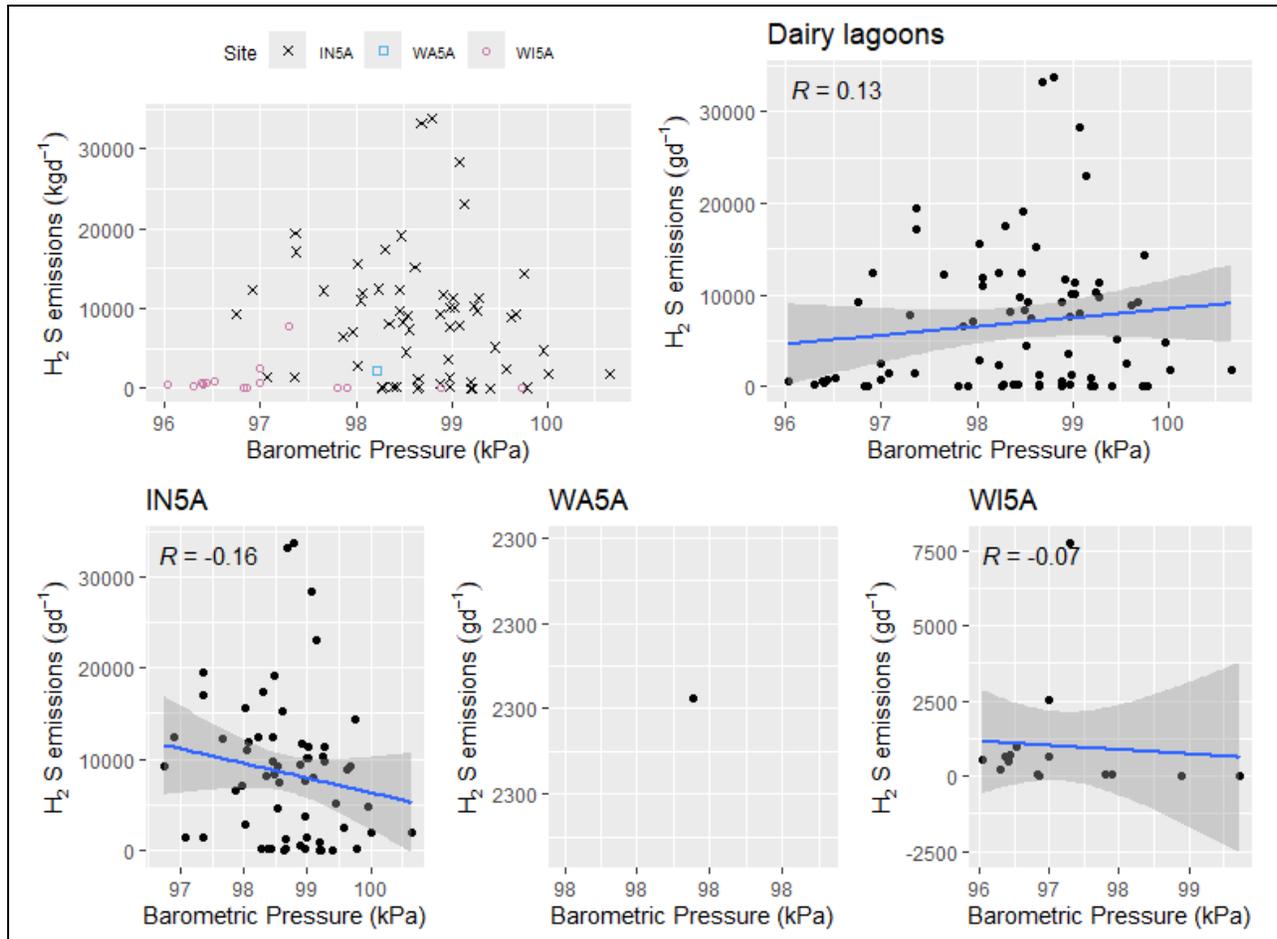


Figure 4.25: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹) versus Barometric_Pressure_kPa.

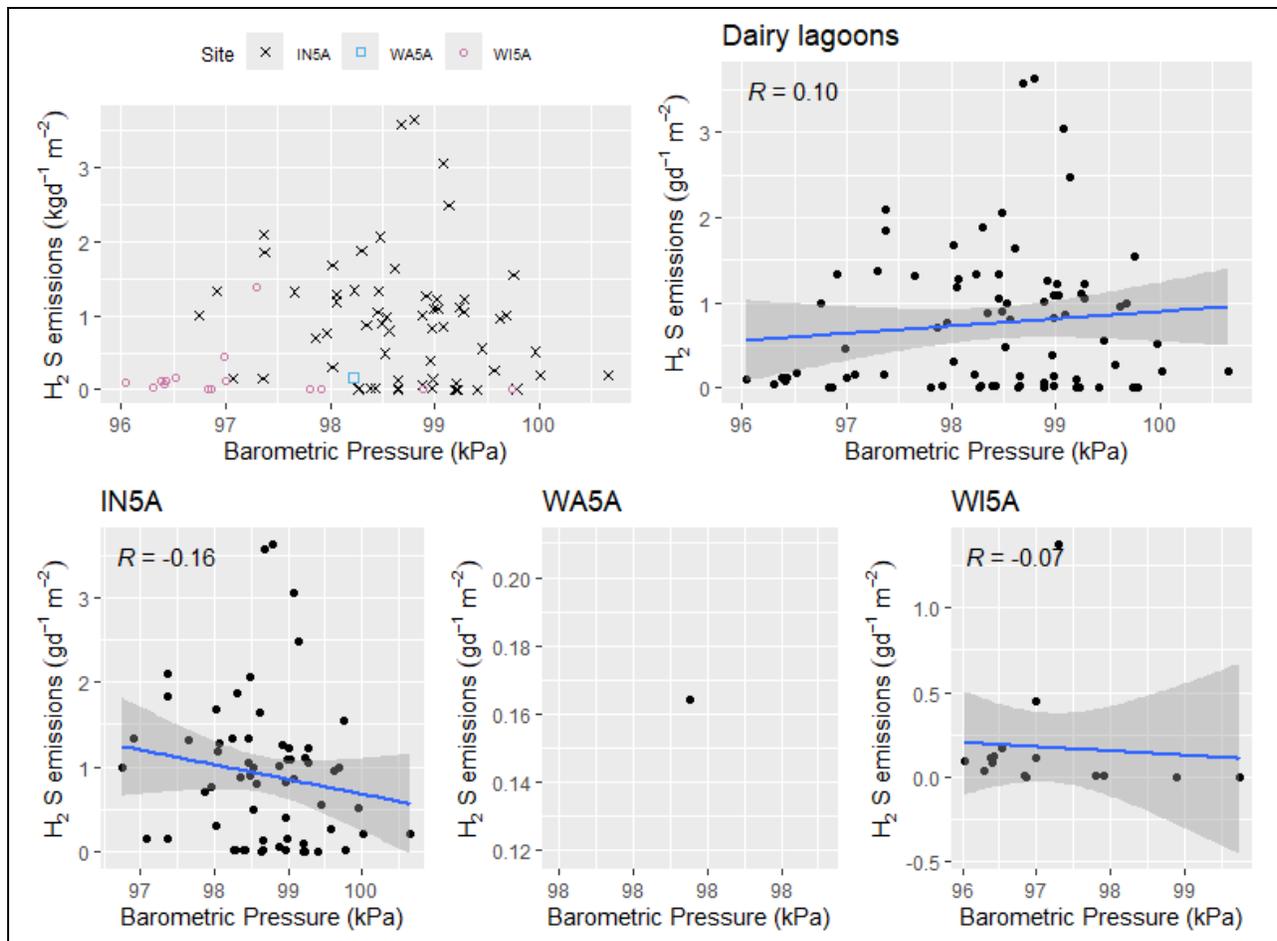


Figure 4.26: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹m⁻²) versus barometric pressure (kPa)

4.2.2.3 Wind speed

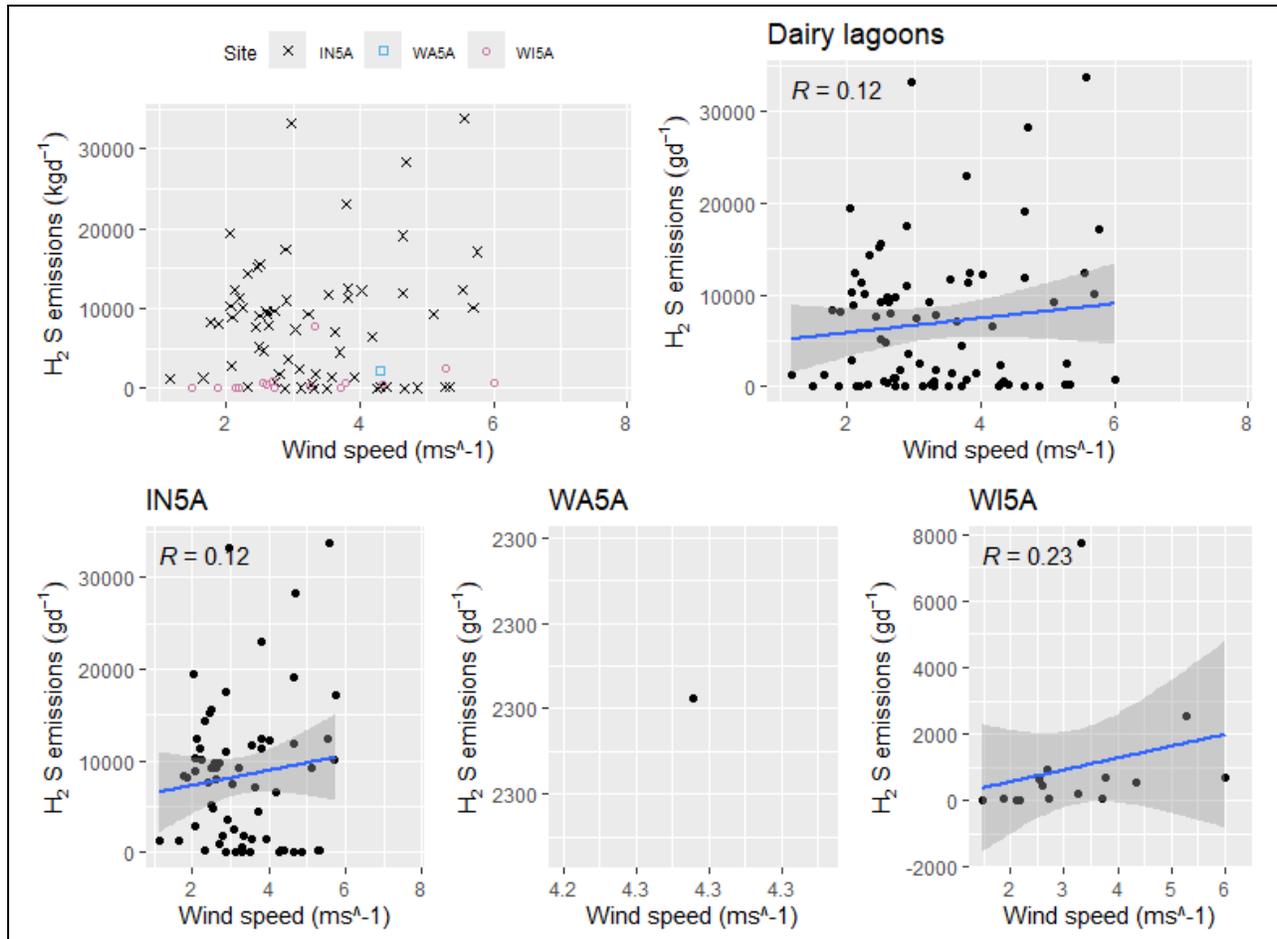


Figure 4.27: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹) versus WindSpeed.

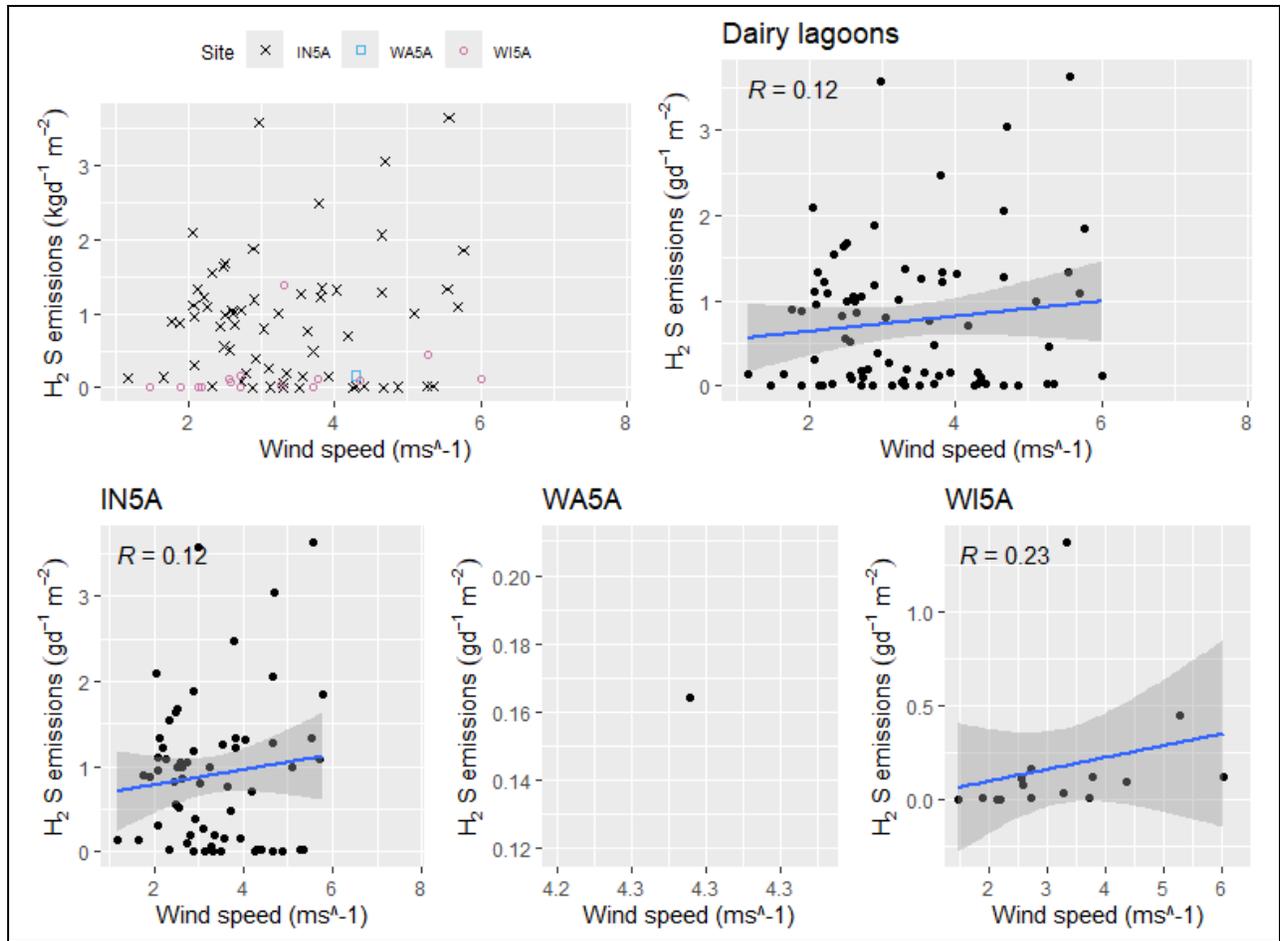


Figure 4.28: Scatter plot of dairy lagoons H₂S emissions (g d⁻¹ m⁻²) versus Wind speed (ms⁻¹)

5 Basins

5.1 Ambient

Table 5.1: Summary of dairy corral R⁻² values for ambient parameters.

Emissions	Parameter	R	R2	Strength
NH ₃ (kgd ⁻¹)	Ambient Temperature (C)	0.41	0.17	slight or weak
H ₂ S (kgd ⁻¹)	Ambient Temperature (C)	-0.04	0	slight or weak
NH ₃ (gd ⁻¹ m ⁻²)	Ambient Temperature (C)	0.41	0.17	slight or weak
H ₂ S (mgd ⁻¹ m ⁻²)	Ambient Temperature (C)	-0.04	0	slight or weak
NH ₃ (kgd ⁻¹)	Ambient Relative humidity (%)	0.41	0.17	slight or weak
H ₂ S (kgd ⁻¹)	Ambient Relative humidity (%)	0.38	0.15	slight or weak
NH ₃ (gd ⁻¹ m ⁻²)	Ambient Relative humidity (%)	0.41	0.17	slight or weak
H ₂ S (mgd ⁻¹ m ⁻²)	Ambient Relative humidity (%)	0.38	0.15	slight or weak
NH ₃ (kgd ⁻¹)	Barometric Pressure (kPa)	0.23	0.05	slight or weak
H ₂ S (kgd ⁻¹)	Barometric Pressure (kPa)	0.11	0.01	slight or weak
NH ₃ (gd ⁻¹ m ⁻²)	Barometric Pressure (kPa)	0.23	0.05	slight or weak
H ₂ S (mgd ⁻¹ m ⁻²)	Barometric Pressure (kPa)	0.11	0.01	slight or weak
NH ₃ (kgd ⁻¹)	Wind Speed (ms ⁻¹)	-0.04	0	slight or weak
H ₂ S (kgd ⁻¹)	Wind Speed (ms ⁻¹)	-0.12	0.01	slight or weak
NH ₃ (gd ⁻¹ m ⁻²)	Wind Speed (ms ⁻¹)	-0.04	0	slight or weak
H ₂ S (mgd ⁻¹ m ⁻²)	Wind Speed (ms ⁻¹)	-0.12	0.01	slight or weak

5.1.1 Ammonia (NH₃)

5.1.1.1 Ambient temperature

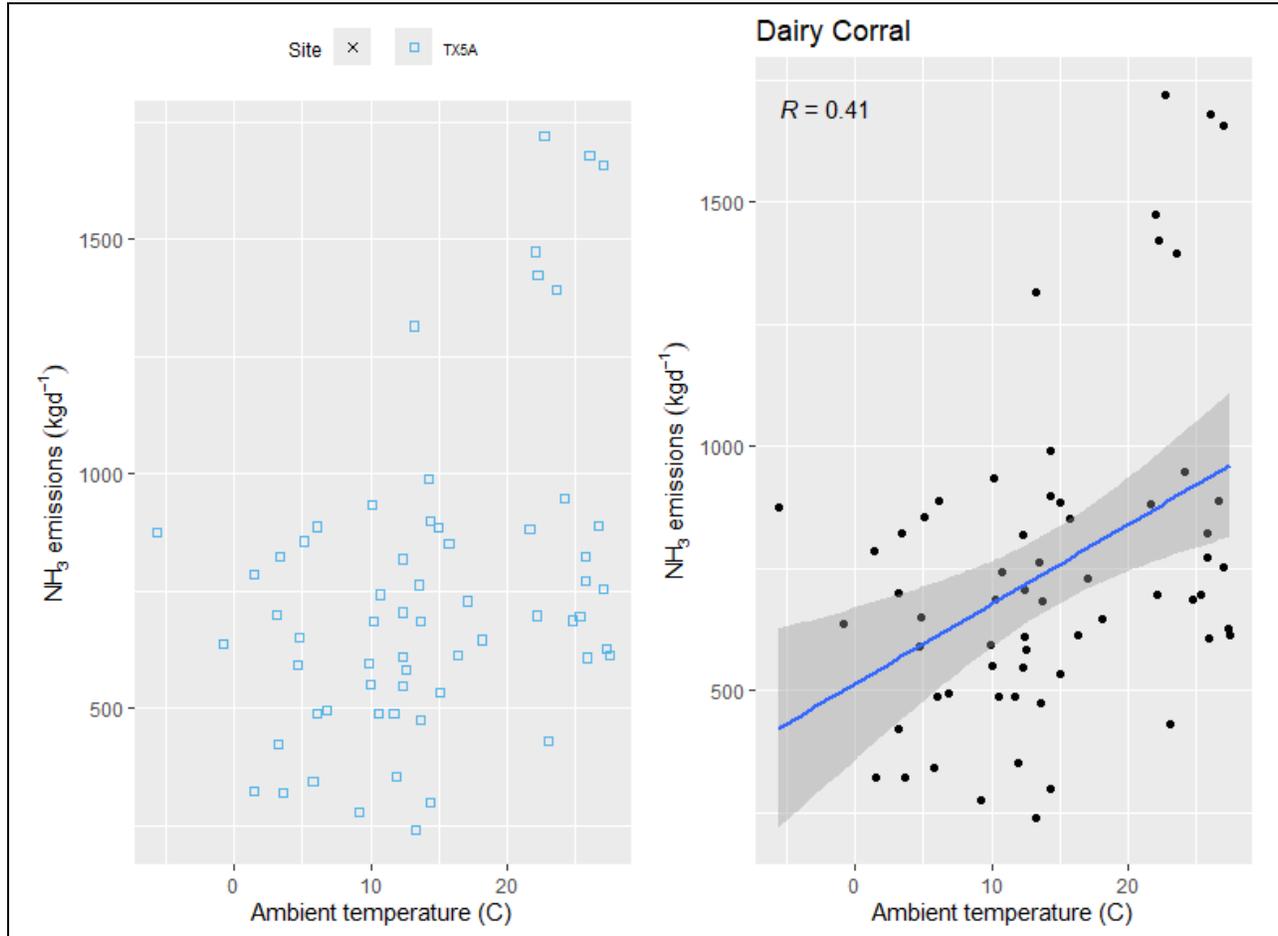
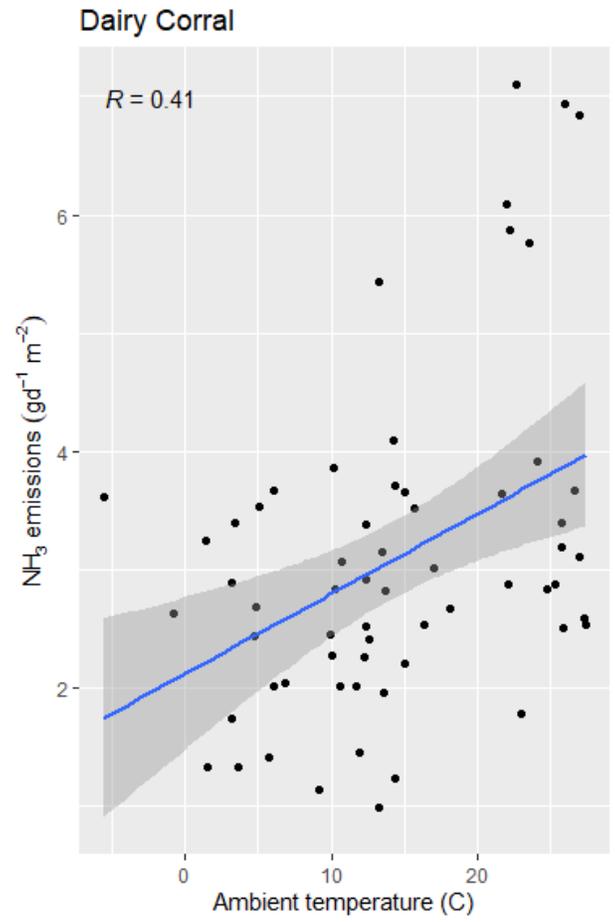
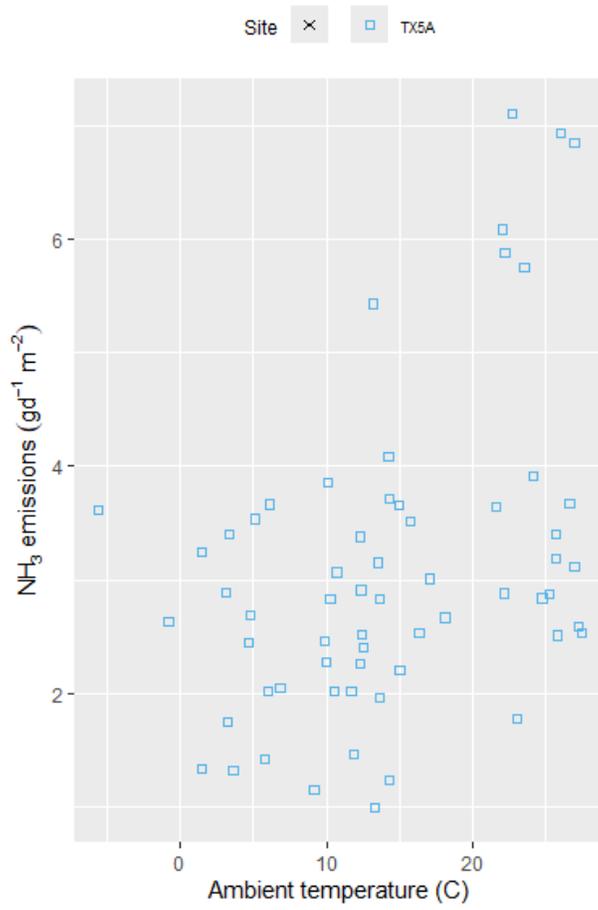


Figure 5.1: Scatter plot of dairy corral NH₃ emissions (kg d⁻¹) versus ambient temperature.



Relative humidity

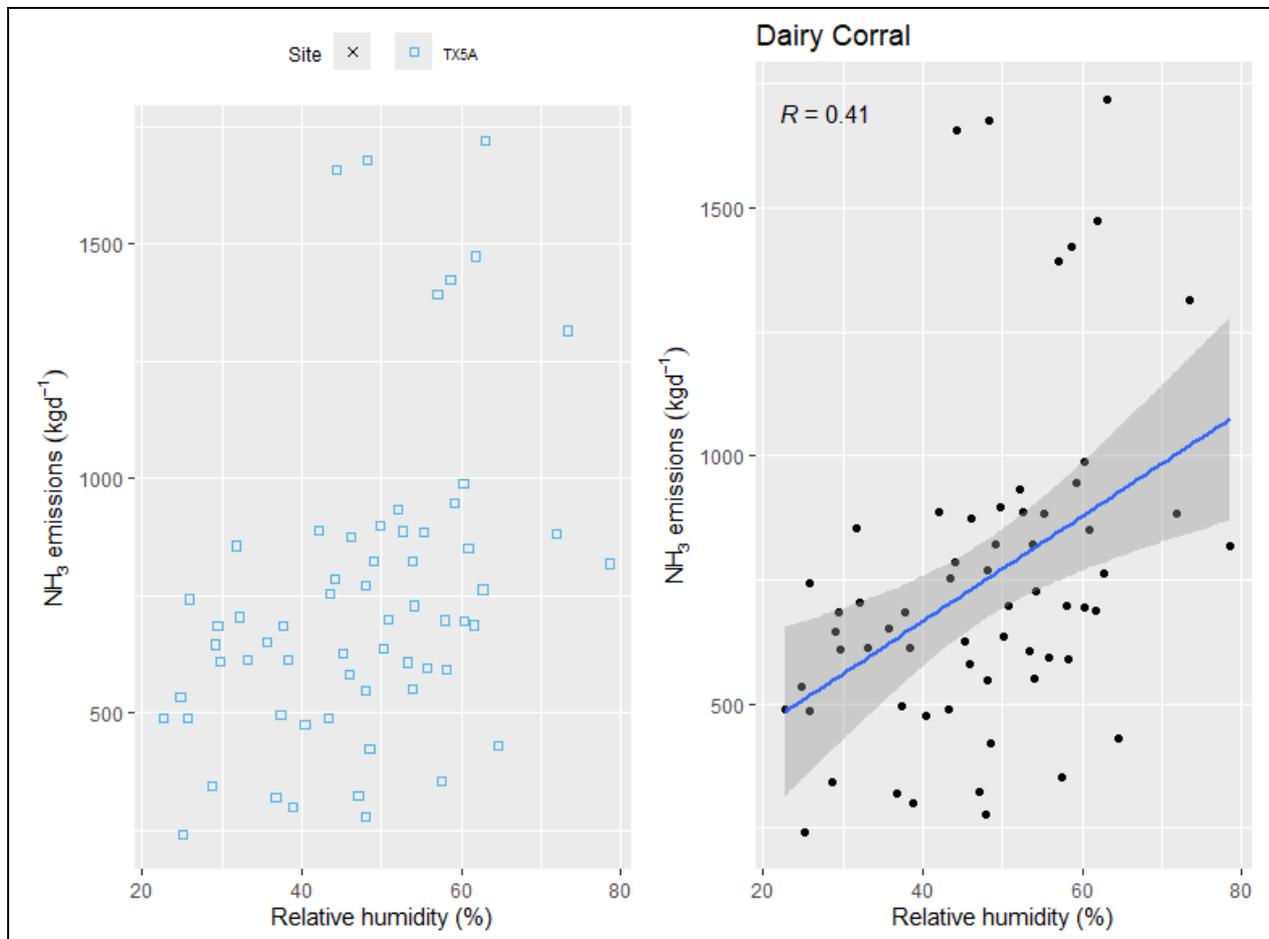


Figure 5.3: Scatter plot of dairy corral NH₃ emissions (kg d⁻¹) versus relative humidity.

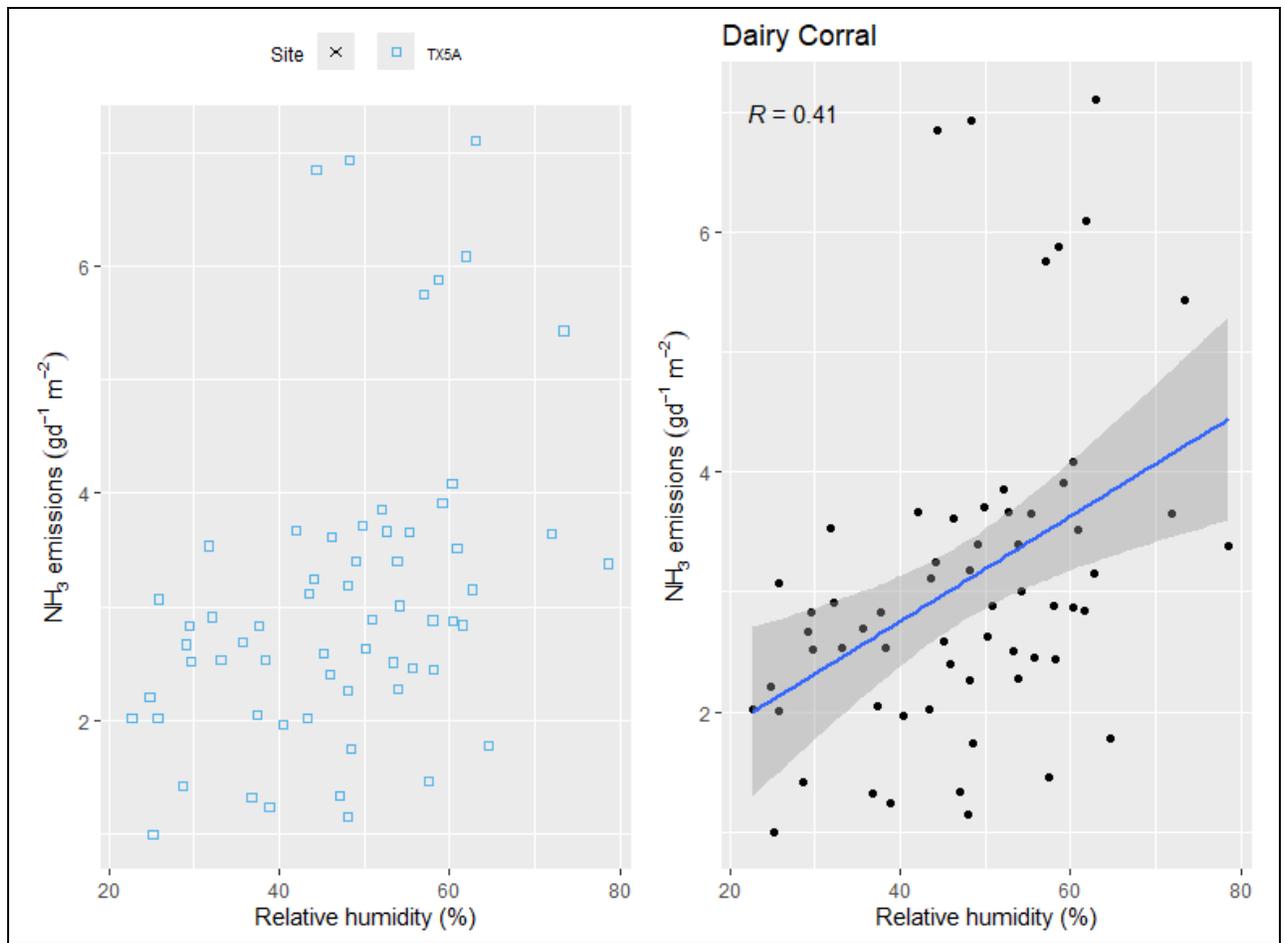


Figure 5.4: Scatter plot of dairy corral NH₃ emissions (g d⁻¹m⁻²) versus relative humidity.

5.1.1.2 Barometric Pressure

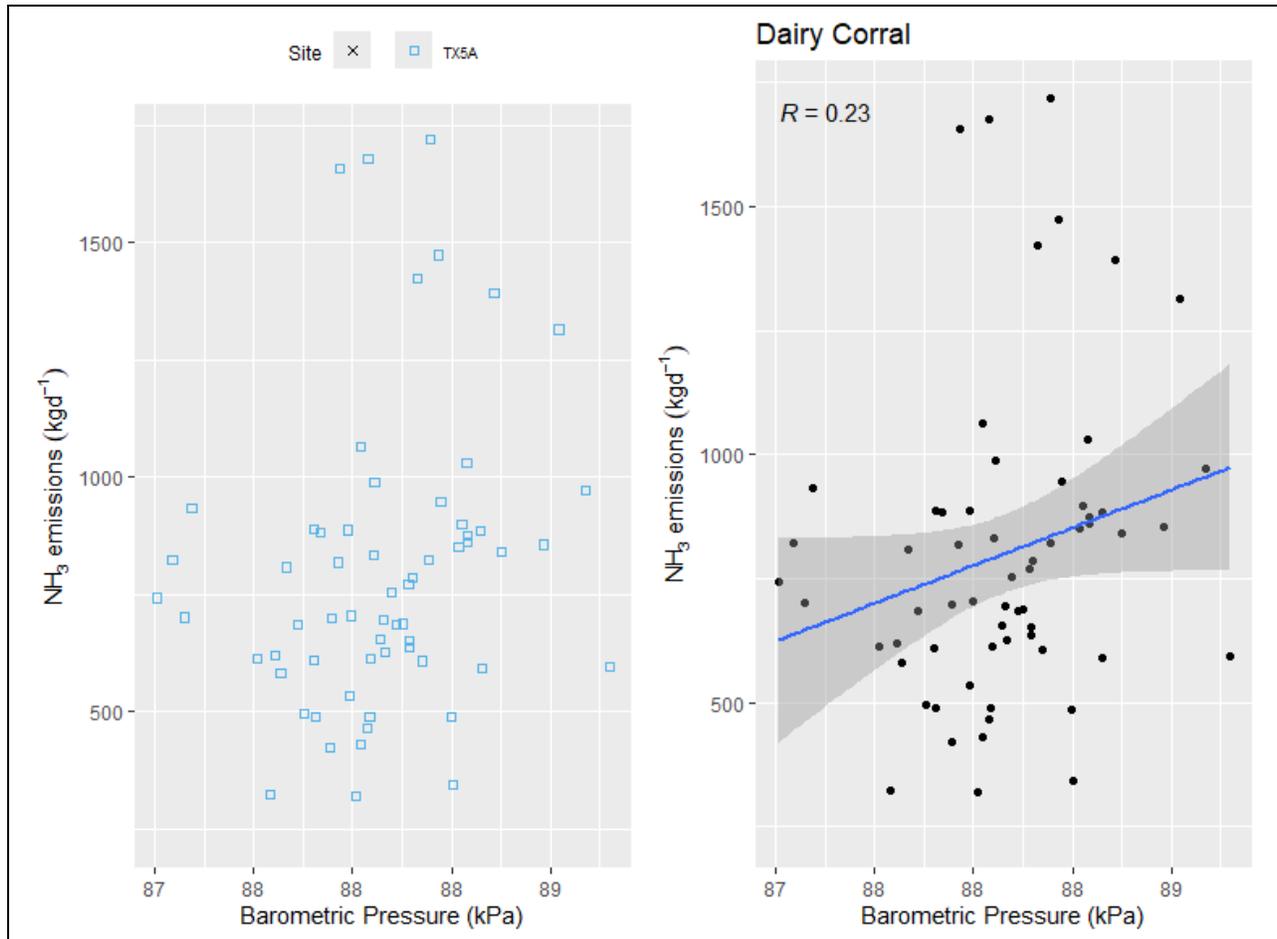


Figure 5.5: Scatter plot of dairy corral NH₃ emissions (kg d⁻¹) versus barometric pressure.

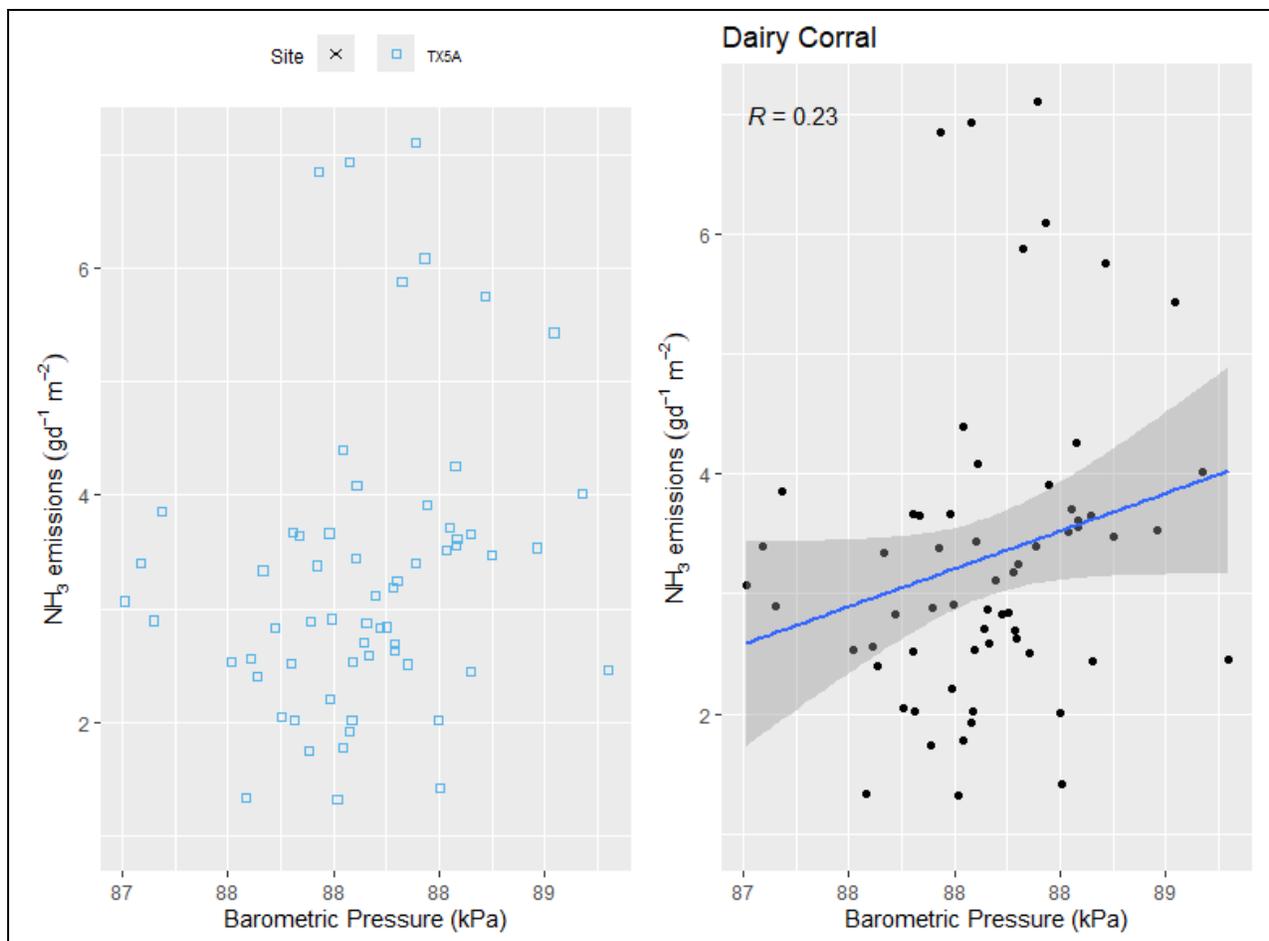


Figure 5.6: Scatter plot of dairy corral NH₃ emissions (g d⁻¹m⁻²) versus barometric pressure.

5.1.1.3 Wind speed

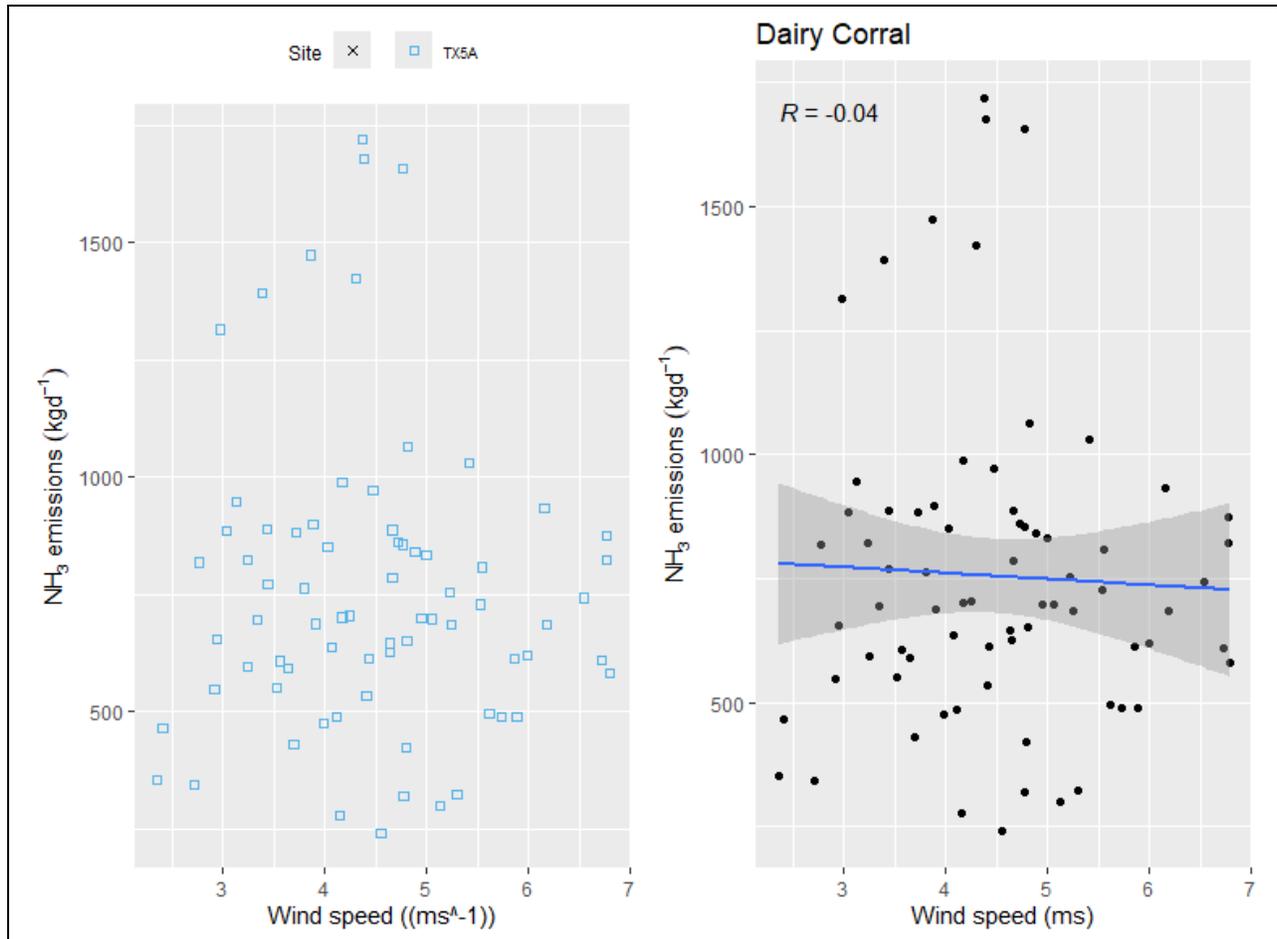


Figure 5.7: Scatter plot of dairy corral NH₃ emissions (kg d⁻¹) versus Wind speed.

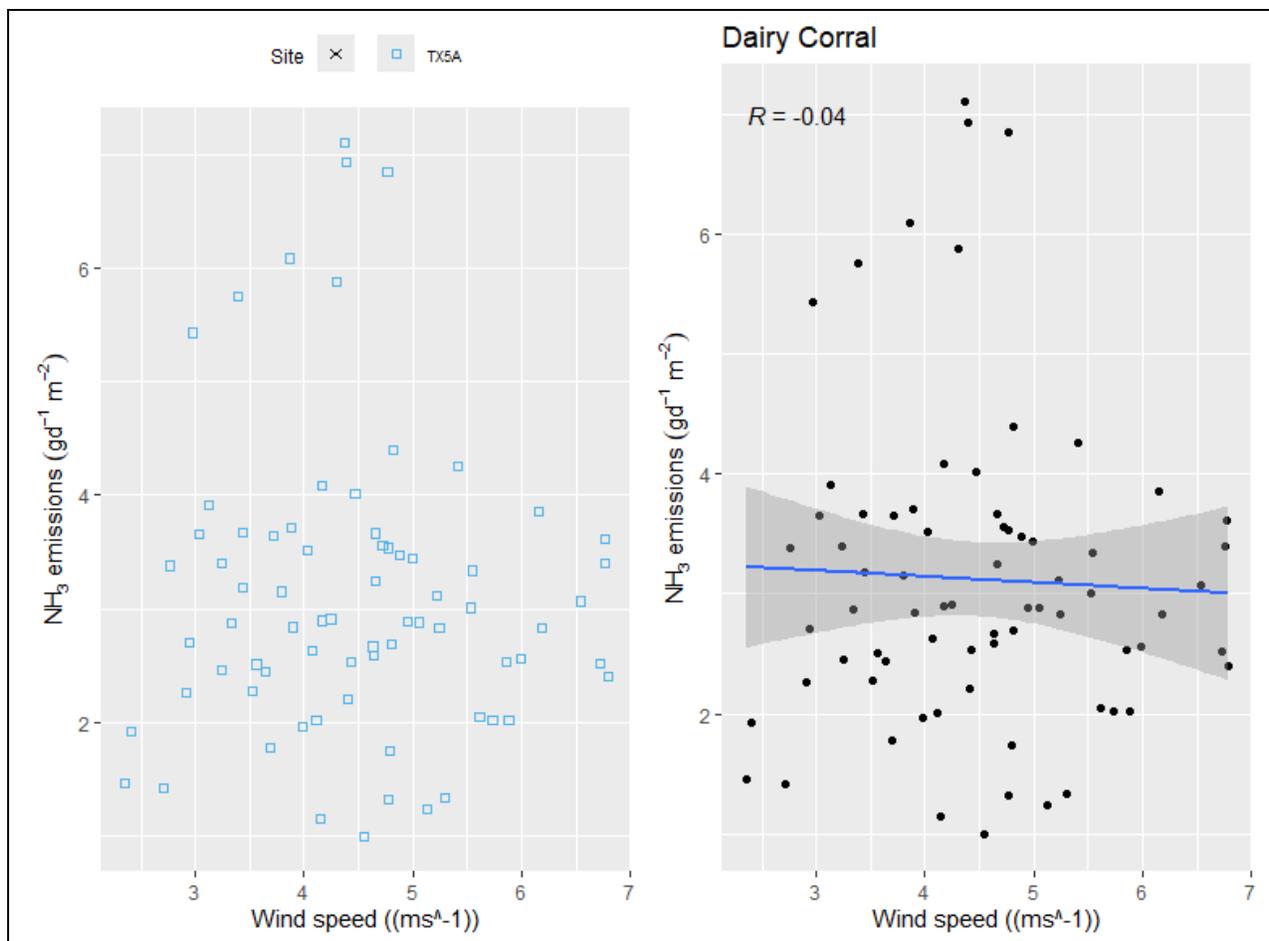


Figure 5.8: Scatter plot of dairy corral NH₃ emissions (g d⁻¹m⁻²) versus Wind speed.

5.1.2 Hydrogen Sulfide (H₂S)

5.1.2.1 Ambient temperature

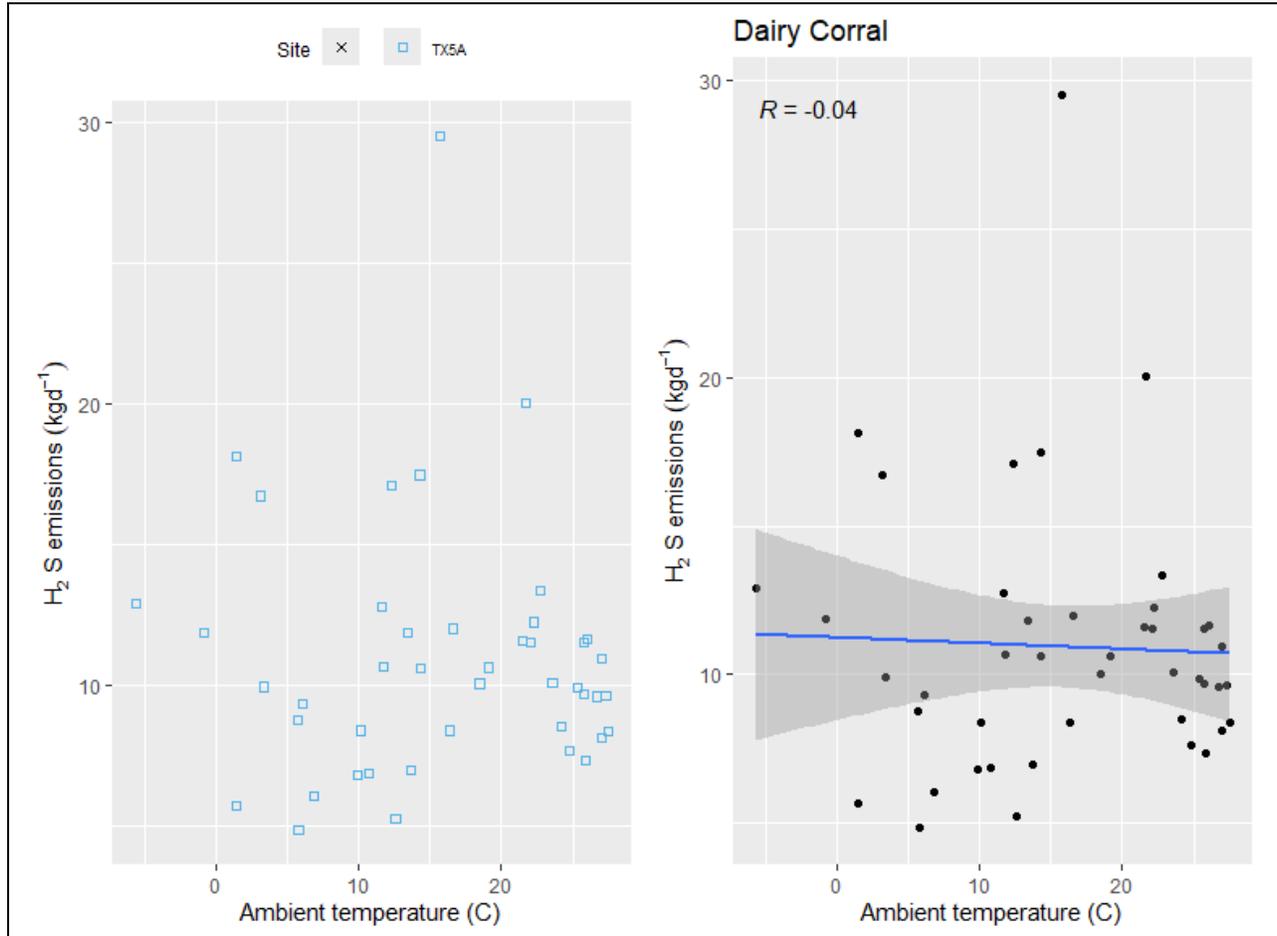
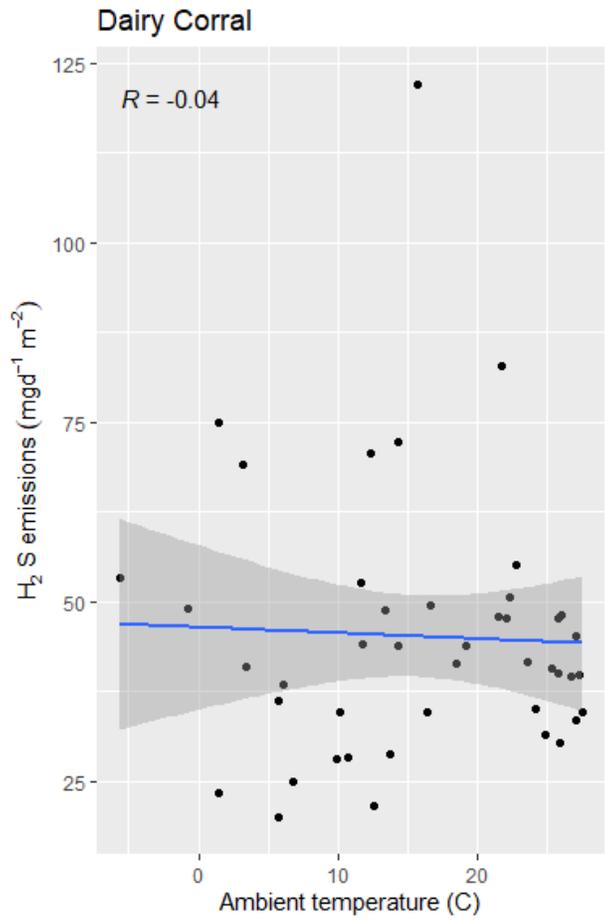
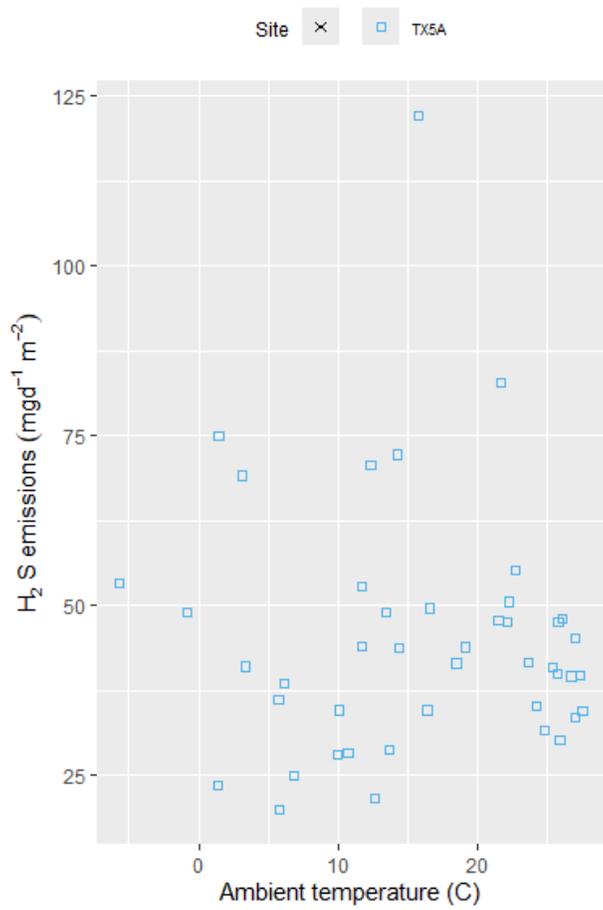


Figure 5.9: Scatter plot of dairy corral H₂S emissions (kg d⁻¹) versus ambient temperature.



Relative humidity

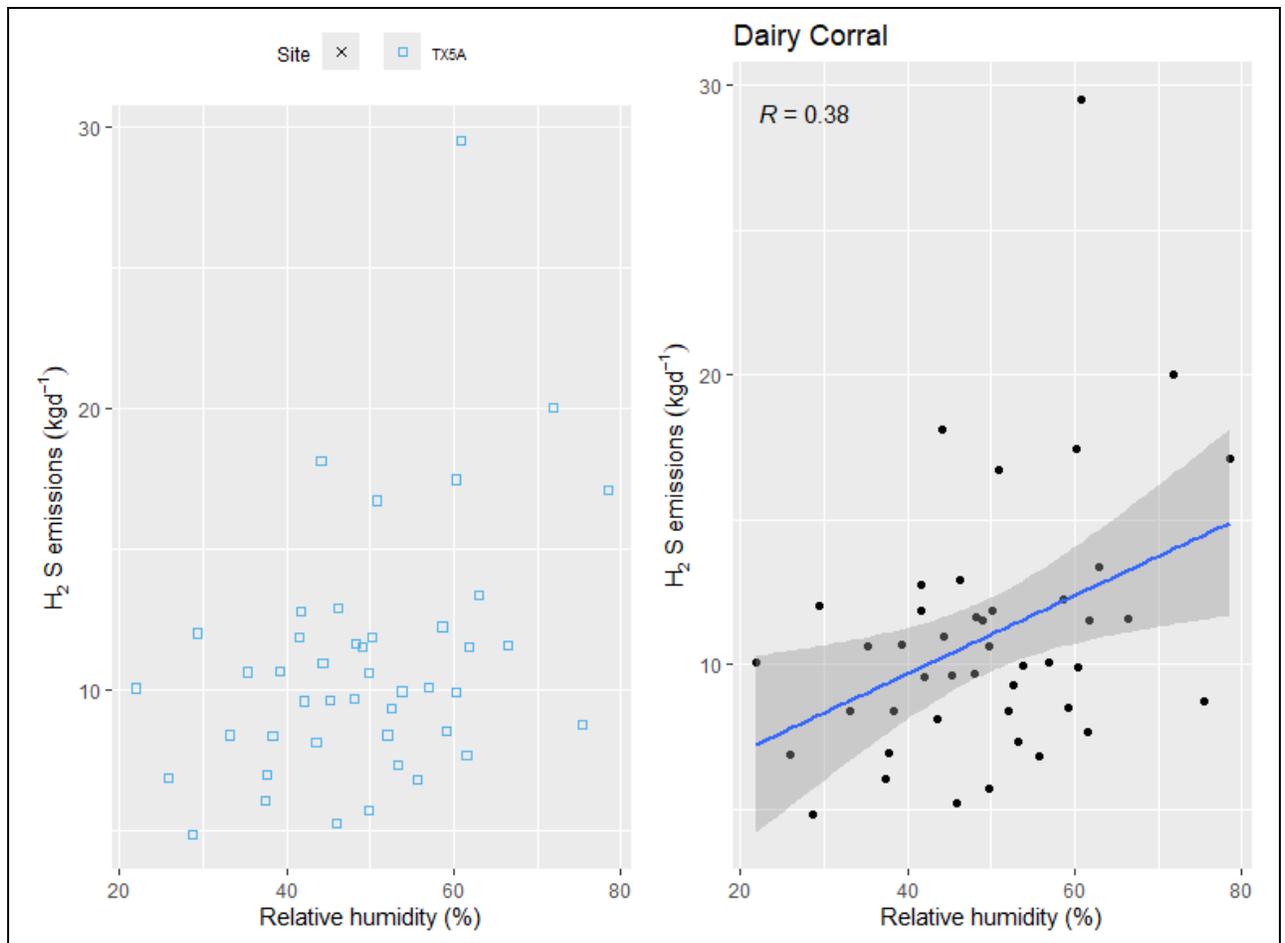


Figure 5.11: Scatter plot of dairy corral H₂S emissions (kg d⁻¹) versus relative humidity.

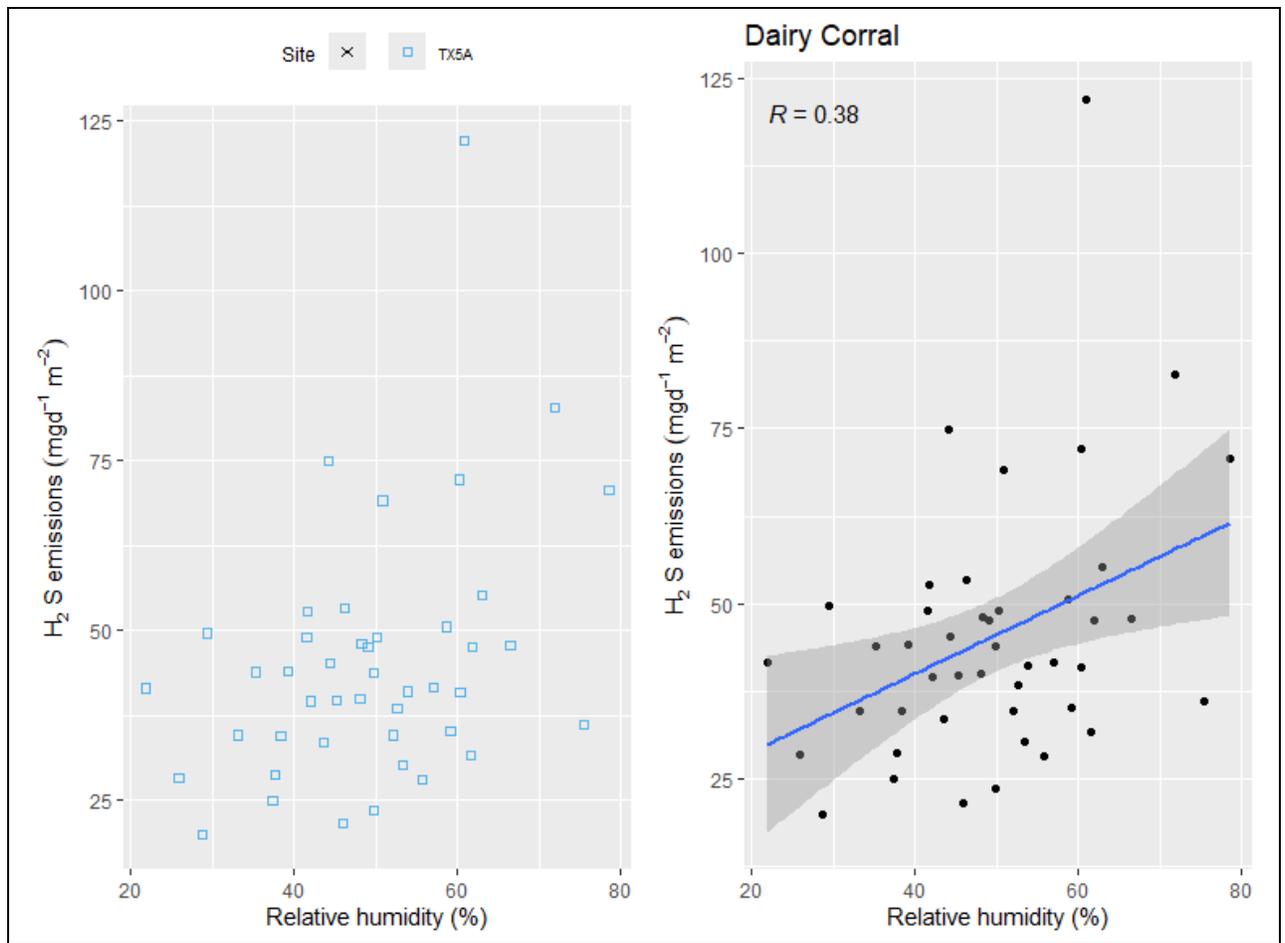


Figure 5.12: Scatter plot of dairy corral H₂S emissions (mg d⁻¹m⁻²) versus relative humidity.

5.1.2.2 Barometric Pressure

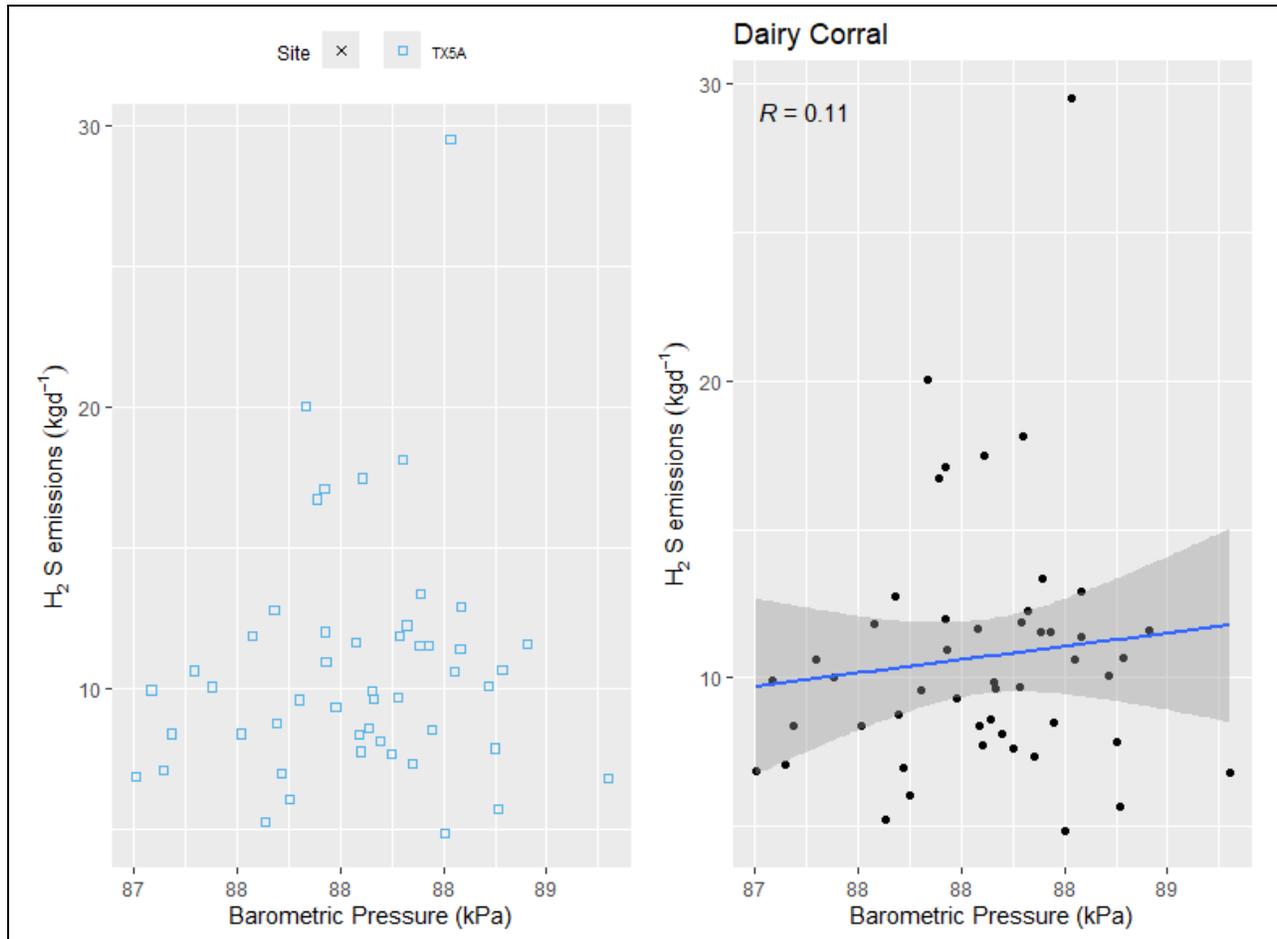


Figure 5.13: Scatter plot of dairy corral H₂S emissions (kg d⁻¹) versus Barometric_Pressure_kPa.

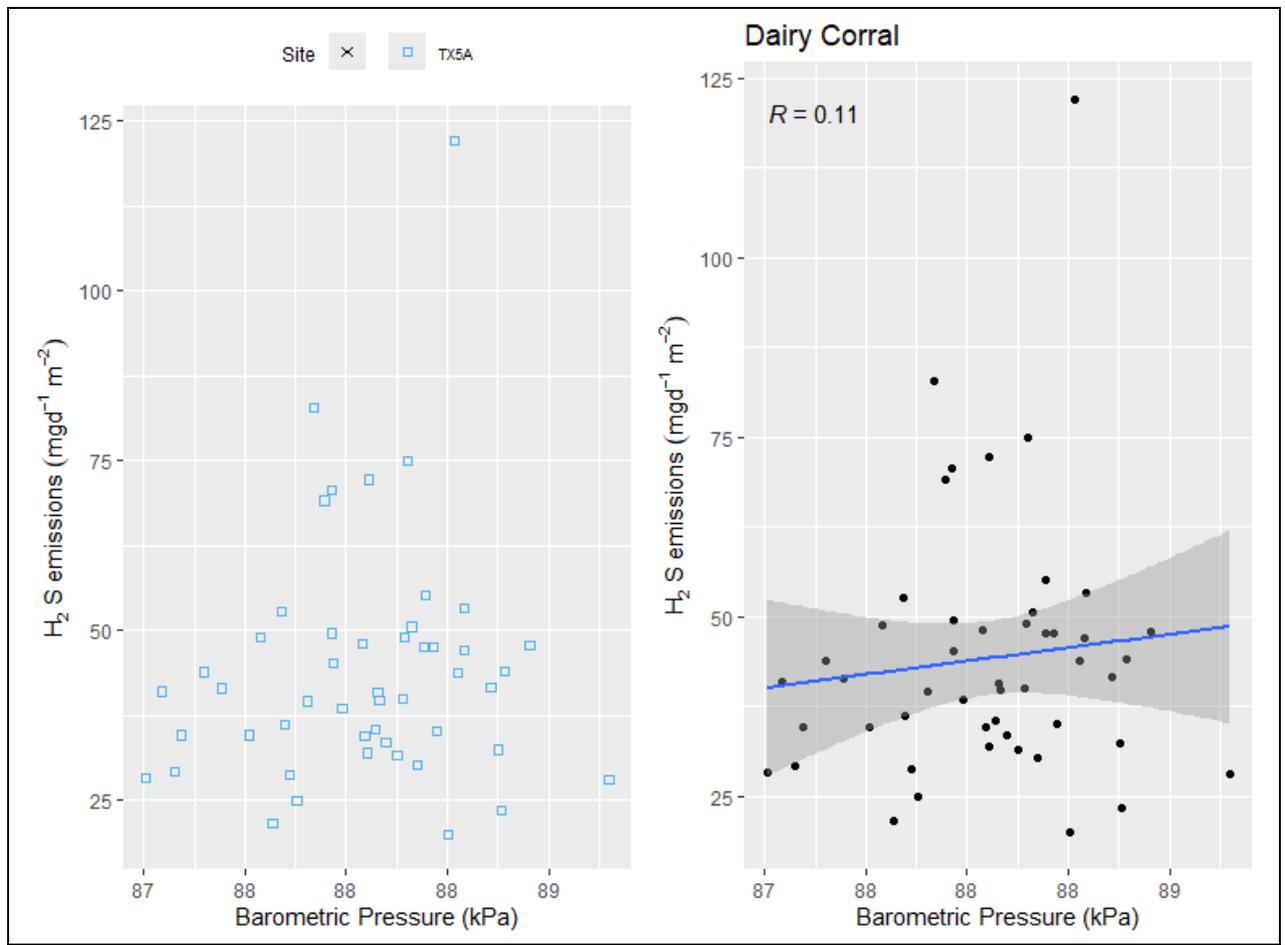


Figure 5.14: Scatter plot of dairy corral H₂S emissions (mg d⁻¹m⁻²) versus barometric pressure (kPa)

5.1.2.3 Wind speed

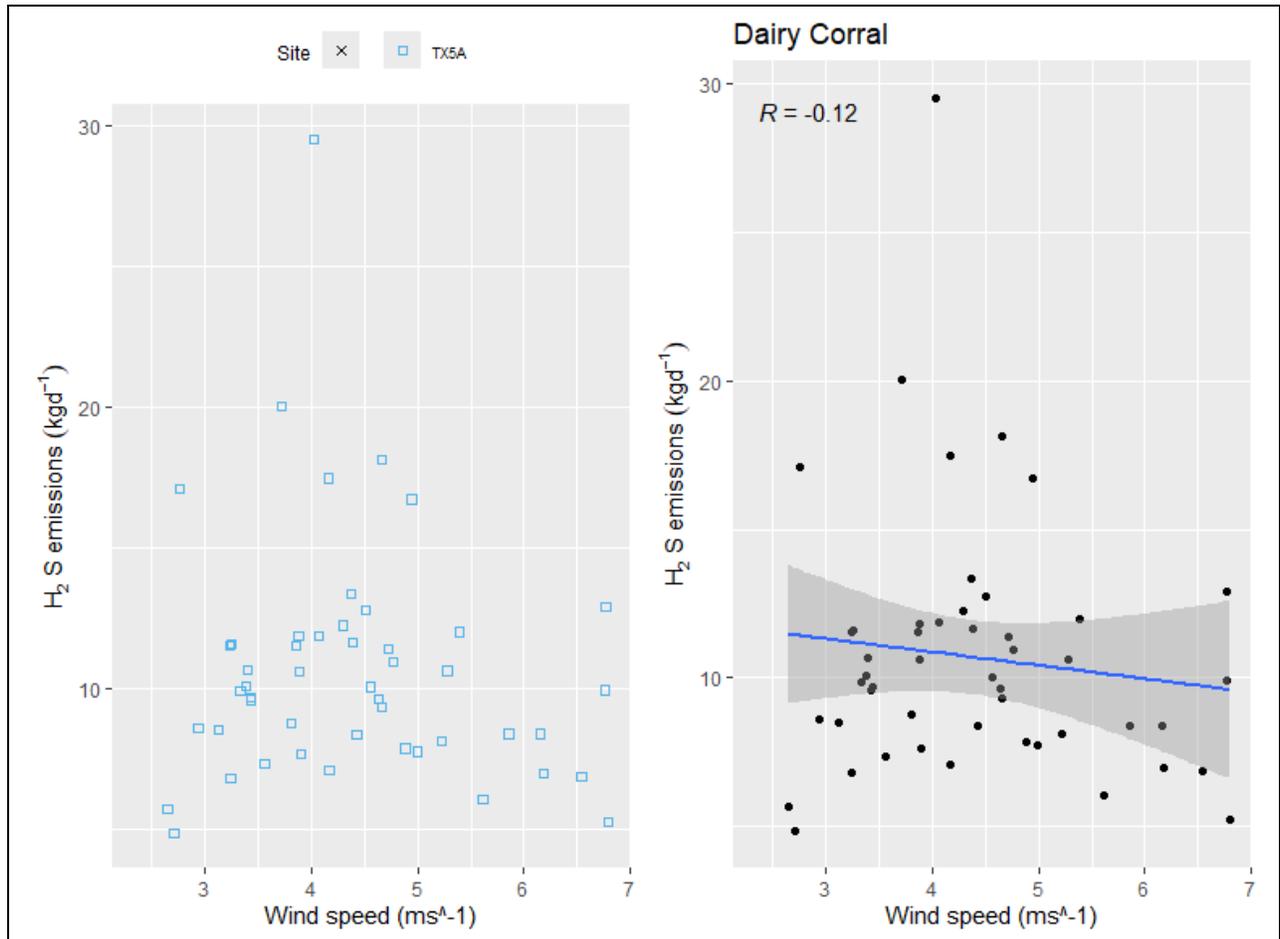


Figure 5.15: Scatter plot of dairy corral H₂S emissions (kg d⁻¹) versus WindSpeed.

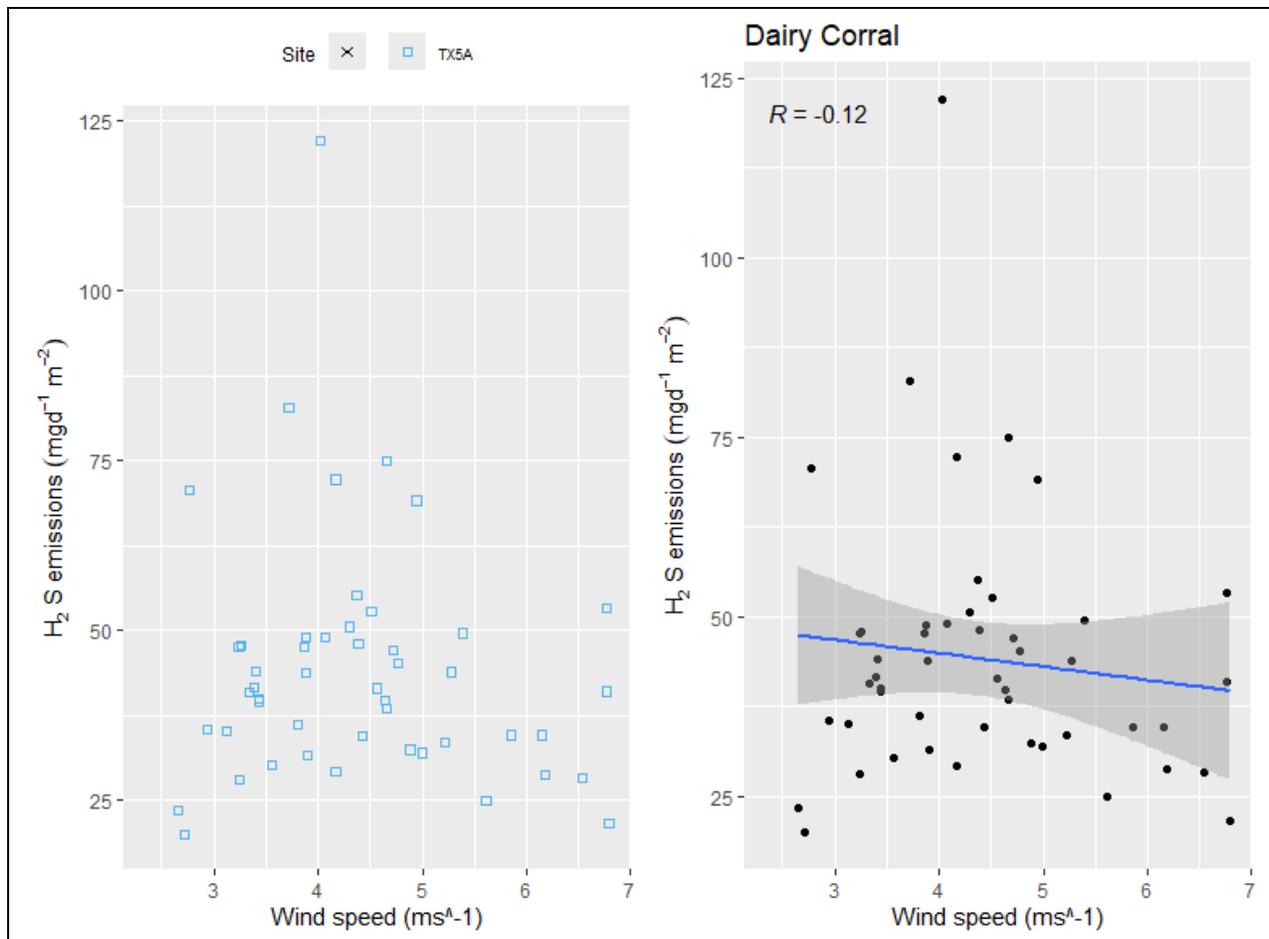


Figure 5.16: Scatter plot of dairy corral H₂S emissions (mg d⁻¹m⁻²) versus Wind speed (ms⁻¹)

Appendix G: Modeling Results

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G.1 Mechanically Ventilated Barns

Table G-1. Parameter combinations tested as models for NH₃ and H₂S emissions.

Model	Parameters
MV-G1	Inventory, manure management system (Flush, Scrape)
MV-G2	Inventory, Exhaust temperature, Exhaust relative humidity, manure management system (Flush, Scrape)
MV-G3	Inventory, Exhaust temperature, manure management system (Flush, Scrape)
MV-G4	Inventory, Exhaust relative humidity, manure management system (Flush, Scrape)
MV-G5	Inventory, Ambient relative humidity, Ambient temperature, manure management system (Flush, Scrape)
MV-G6	Inventory, Manure age, Ambient temperature, manure management system (Flush, Scrape)
MV-G7	Inventory, Ambient relative humidity, manure management system (Flush, Scrape)
MV-G8	Inventory, Ambient temperature, Exhaust relative humidity, manure management system (Flush, Scrape)
MV-G9	Inventory, Exhaust temperature, Ambient relative humidity, manure management system (Flush, Scrape)

Table G-2. Parameter combinations tested as models for PM₁₀, PM_{2.5}, and TSP emissions.

Model	Parameters
MV-P1	Intercept, Inventory
MV-P2	Intercept, Inventory, Exhaust temperature, Exhaust relative humidity
MV-P3	Intercept, Inventory, Exhaust temperature
MV-P4	Intercept, Inventory, Exhaust relative humidity
MV-P5	Intercept, Inventory, Ambient relative humidity, Ambient temperature
MV-P6	Intercept, Inventory, Manure age, Ambient temperature
MV-P7	Intercept, Inventory, Ambient relative humidity
MV-P8	Intercept, Inventory, Ambient temperature, Exhaust relative humidity
MV-P9	Intercept, Inventory, Exhaust temperature, Ambient relative humidity
MV-P10	Intercept, Exhaust temperature, Exhaust relative humidity (Emissions normalized by Inventory)
MV-P11	Intercept, Exhaust temperature (Emissions normalized by Inventory)
MV-P12	Intercept, Exhaust relative humidity (Emissions normalized by Inventory)
MV-P13	Intercept, Ambient temperature, Ambient relative humidity (Emissions normalized by Inventory)
MV-P14	Intercept, Ambient temperature (Emissions normalized by Inventory)
MV-P15	Intercept, Ambient relative humidity (Emissions normalized by Inventory)
MV-P16	Intercept, Ambient temperature, Exhaust relative humidity (Emissions normalized by Inventory)
MV-P17	Intercept, Ambient relative humidity, Exhaust temperature (Emissions normalized by Inventory)

G.1.1 Ammonia (NH₃)

Table G-3. Parameter and estimates NH₃ emission models for dairy mechanically ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
MV-G1	Inventory	1.747472	0.13368	<.0001
	FLUSH	1.968975	0.07724	<.0001
	SCRAPE	2.160489	0.0875	<.0001
MV-G2	Inventory	1.737001	0.05581	<.0001
	Exhaust temperature	0.048392	0.00111	<.0001
	Exhaust relative humidity	0.003011	0.00068	<.0001
	FLUSH	1.194081	0.05649	<.0001
	SCRAPE	1.396364	0.05863	<.0001
MV-G3	Inventory	1.752395	0.06206	<.0001
	Exhaust temperature	0.047056	0.00114	<.0001
	FLUSH	1.456887	0.03748	<.0001
	SCRAPE	1.619738	0.04267	<.0001
MV-G4	Inventory	1.709631	0.13396	<.0001
	Exhaust relative humidity	0.00436	0.00087	<.0001
	FLUSH	1.686656	0.0987	<.0001
	SCRAPE	1.868988	0.10501	<.0001
MV-G5	Inventory	1.773753	0.06478	<.0001
	Ambient temperature	0.029581	0.00088	<.0001
	Ambient relative humidity	-0.000242	0.00049	0.6239
	FLUSH	1.763365	0.05105	<.0001
	SCRAPE	1.881425	0.05421	<.0001
MV-G6	Inventory	1.773832	0.06477	<.0001
	Ambient temperature	0.029586	0.00088	<.0001
	FLUSH	1.746585	0.03789	<.0001
	SCRAPE	1.864935	0.04253	<.0001
MV-G7	Inventory	1.790687	0.13499	<.0001
	Ambient relative humidity	0.00001	0.00058	0.9866
	FLUSH	1.953638	0.08808	<.0001
	SCRAPE	2.144209	0.09609	<.0001
MV-G8	Inventory	1.731025	0.05731	<.0001
	Exhaust relative humidity	0.004884	0.00071	<.0001
	Ambient temperature	0.031826	0.00086	<.0001
	FLUSH	1.366088	0.05869	<.0001
	SCRAPE	1.515295	0.06027	<.0001
MV-G9	Inventory	1.775013	0.06212	<.0001
	Exhaust temperature	0.04585	0.00117	<.0001
	Ambient relative humidity	-0.00111	0.00047	<i>0.0183</i>
	FLUSH	1.564041	0.04971	<.0001
	SCRAPE	1.700058	0.05275	<.0001

Table G-4. Fit and evaluation statistics for dairy mechanically ventilated barn NH₃ models tested.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (kg day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
MV-G1	-156	-146	-146	-144	0.736	11.54	43.67	10.29	-0.625	-2.65
MV-G2	-1347	-1333	-1333	-1330	0.921	6.812	22.36	5.389	-0.566	-2.347
MV-G3	-1345	-1333	-1333	-1330	0.911	7.291	23.68	5.58	-0.434	-1.843
MV-G4	-125	-113	-113	-110	0.733	11.61	42.99	10.36	-0.685	-2.841
MV-G5	-1105	-1091	-1091	-1088	0.909	7.322	24.57	5.957	-0.579	-2.389
MV-G6	-1105	-1093	-1093	-1091	0.909	7.322	24.57	5.959	-0.583	-2.404
MV-G7	-255	-243	-243	-241	0.754	11.4	42.74	10.35	-0.784	-3.24
MV-G8	-1155	-1141	-1141	-1139	0.922	6.773	22.57	5.609	-0.628	-2.527
MV-G9	-1314	-1300	-1300	-1298	0.918	6.999	23	5.568	-0.45	-1.859

^a Based on transformed data (i.e., ln(NH₃)).

^b Based on back-transformed data.

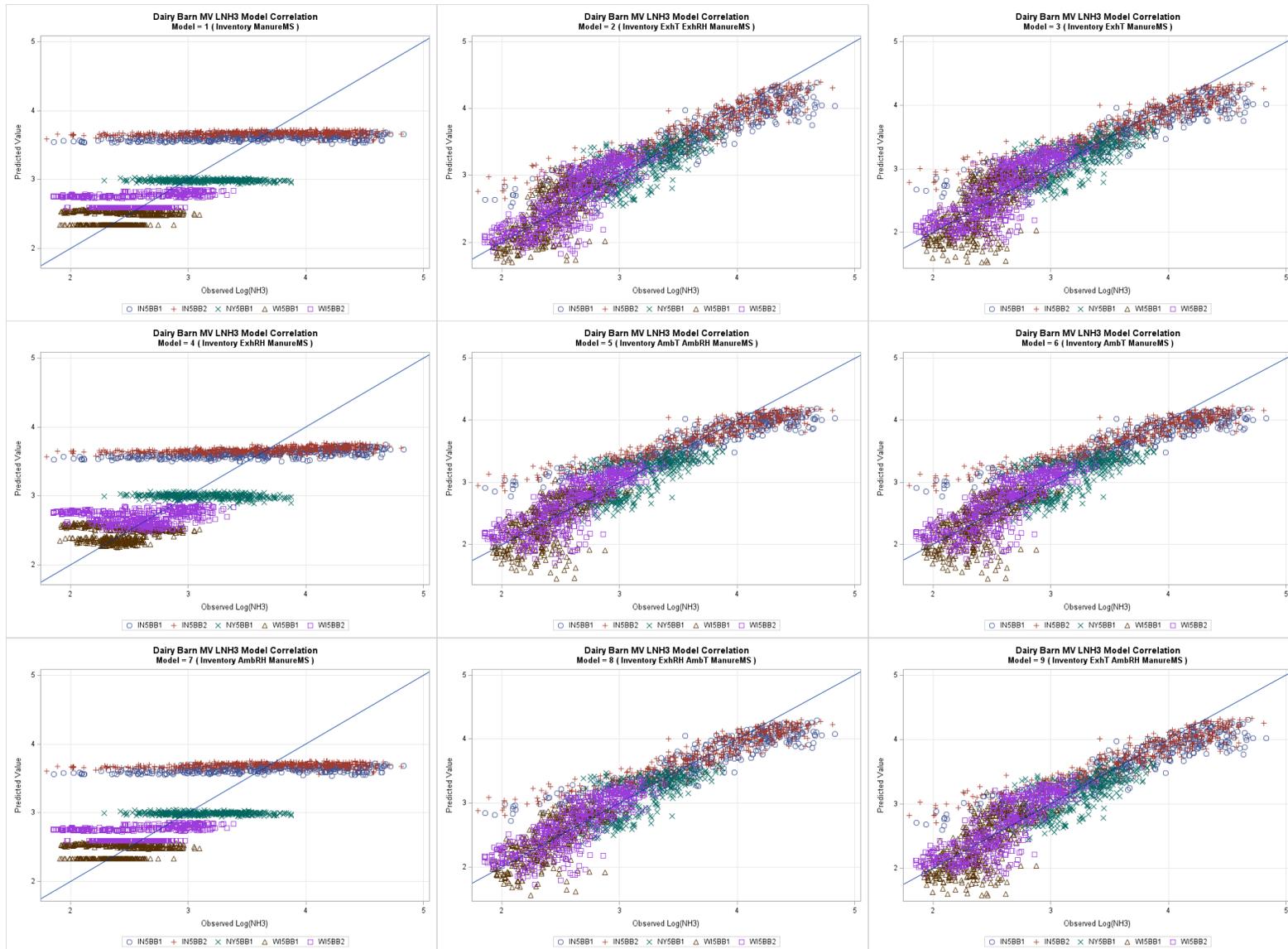


Figure G-1. Dairy mechanically ventilated barn NH₃ one-to-one plots models 1 through 9, log transformed.

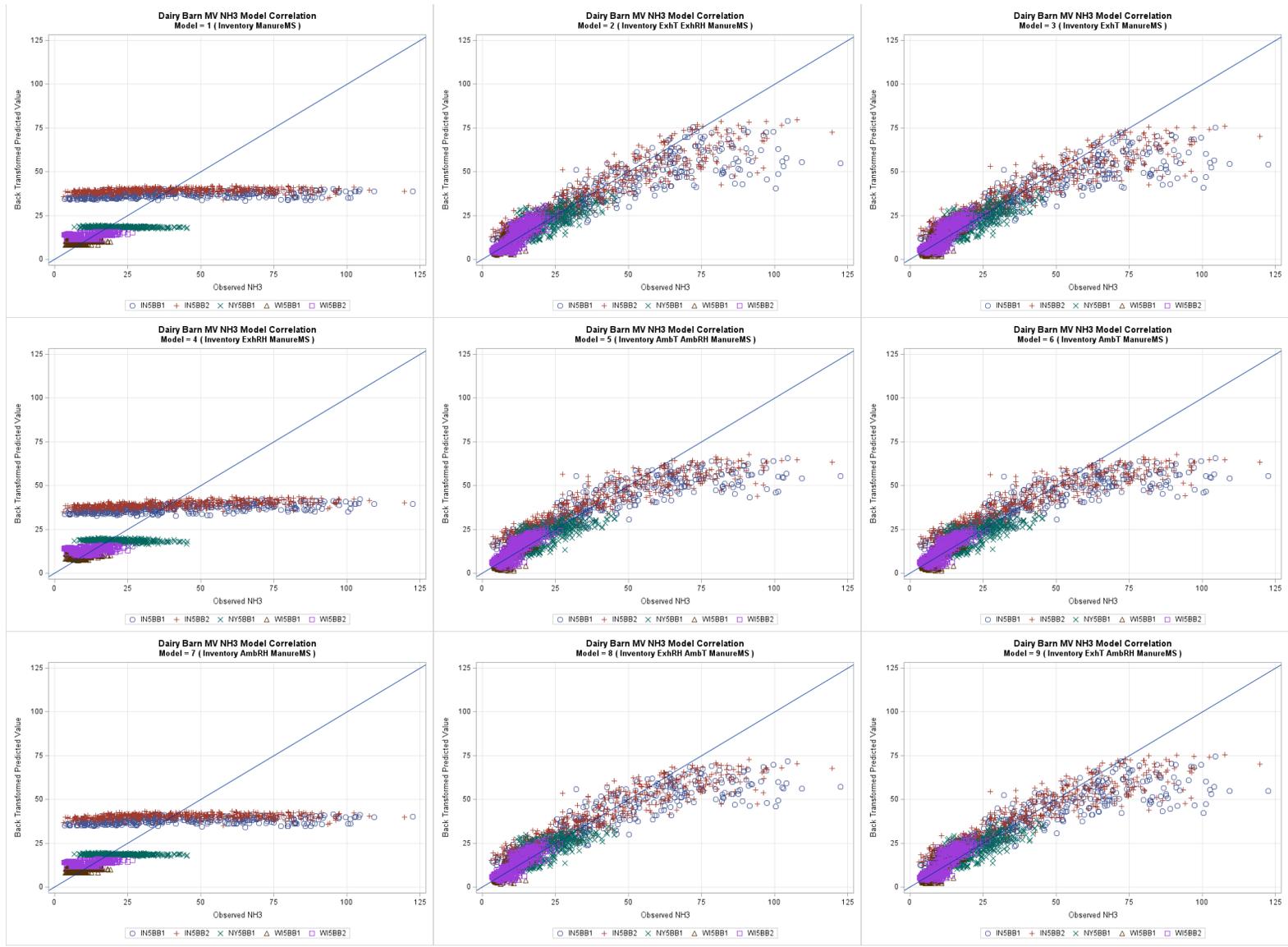


Figure G-2. Dairy mechanically ventilated barn NH₃ one-to-one plots models 1 through 9, back transformed.

G.1.2 Hydrogen Sulfide (H₂S)

Table G-5. Parameter and estimates H₂S emission models for dairy mechanically ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
MV-G1	Inventory	0.85197	0.10927	<.0001
	FLUSH	7.489765	0.0634	<.0001
	SCRAPE	6.409219	0.07174	<.0001
MV-G2	Inventory	0.749681	0.07466	<.0001
	Exhaust temperature	0.023646	0.00164	<.0001
	Exhaust relative humidity	0.003395	0.00106	0.0014
	FLUSH	7.001505	0.0838	<.0001
	SCRAPE	5.943562	0.08587	<.0001
MV-G3	Inventory	0.790491	0.07913	<.0001
	Exhaust temperature	0.021314	0.00166	<.0001
	FLUSH	7.272397	0.04871	<.0001
	SCRAPE	6.193112	0.05513	<.0001
MV-G4	Inventory	0.828413	0.10997	<.0001
	Exhaust relative humidity	0.002065	0.0011	0.0598
	FLUSH	7.362012	0.09788	<.0001
	SCRAPE	6.273489	0.10168	<.0001
MV-G5	Inventory	0.862257	0.08689	<.0001
	Ambient temperature	0.012718	0.00127	<.0001
	Ambient relative humidity	-0.00075	0.00072	0.2988
	FLUSH	7.459213	0.07186	<.0001
	SCRAPE	6.338222	0.07532	<.0001
MV-G6	Inventory	0.86173	0.08664	<.0001
	Ambient temperature	0.012786	0.00127	<.0001
	FLUSH	7.406887	0.05129	<.0001
	SCRAPE	6.287004	0.05691	<.0001
MV-G7	Inventory	0.921144	0.1135	<.0001
	Ambient relative humidity	-0.000989	0.00072	0.167
	FLUSH	7.551565	0.0833	<.0001
	SCRAPE	6.449859	0.08831	<.0001
MV-G8	Inventory	0.804201	0.08038	<.0001
	Exhaust relative humidity	0.003593	0.00105	0.0006
	Ambient temperature	0.015583	0.00126	<.0001
	FLUSH	7.13763	0.08504	<.0001
	SCRAPE	6.029703	0.08645	<.0001
MV-G9	Inventory	0.848409	0.0827	<.0001
	Exhaust temperature	0.020512	0.00171	<.0001
	Ambient relative humidity	-0.001261	0.00072	0.0782
	FLUSH	7.378145	0.071	<.0001
	SCRAPE	6.265544	0.07426	<.0001

Table G-6. Fit and evaluation statistics for H₂S emission models for dairy mechanically ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
MV-G1	1234	1244	1244	1246	0.59	5.33	74.81	649.1	0.724	0.083
MV-G2	1035	1049	1049	1051	0.746	4.287	62.99	527	-46.27	-5.53
MV-G3	1122	1134	1134	1137	0.726	4.47	63.99	555.2	-38.55	-4.443
MV-G4	1163	1175	1176	1178	0.588	5.33	76.61	641	-4.608	-0.551
MV-G5	848	862	863	865	0.713	4.467	64.4	553.9	-38.24	-4.446
MV-G6	850	862	862	864	0.714	4.46	64.31	553.1	-38.66	-4.495
MV-G7	916	928	928	931	0.595	5.201	74.21	633.7	1	0.117
MV-G8	750	764	764	767	0.742	4.232	62.78	518.8	-47.85	-5.79
MV-G9	818	832	832	834	0.729	4.388	63.2	539.7	-42.24	-4.946

^a Based on transformed data (i.e., ln(H₂S)).

^b Based on back-transformed data.

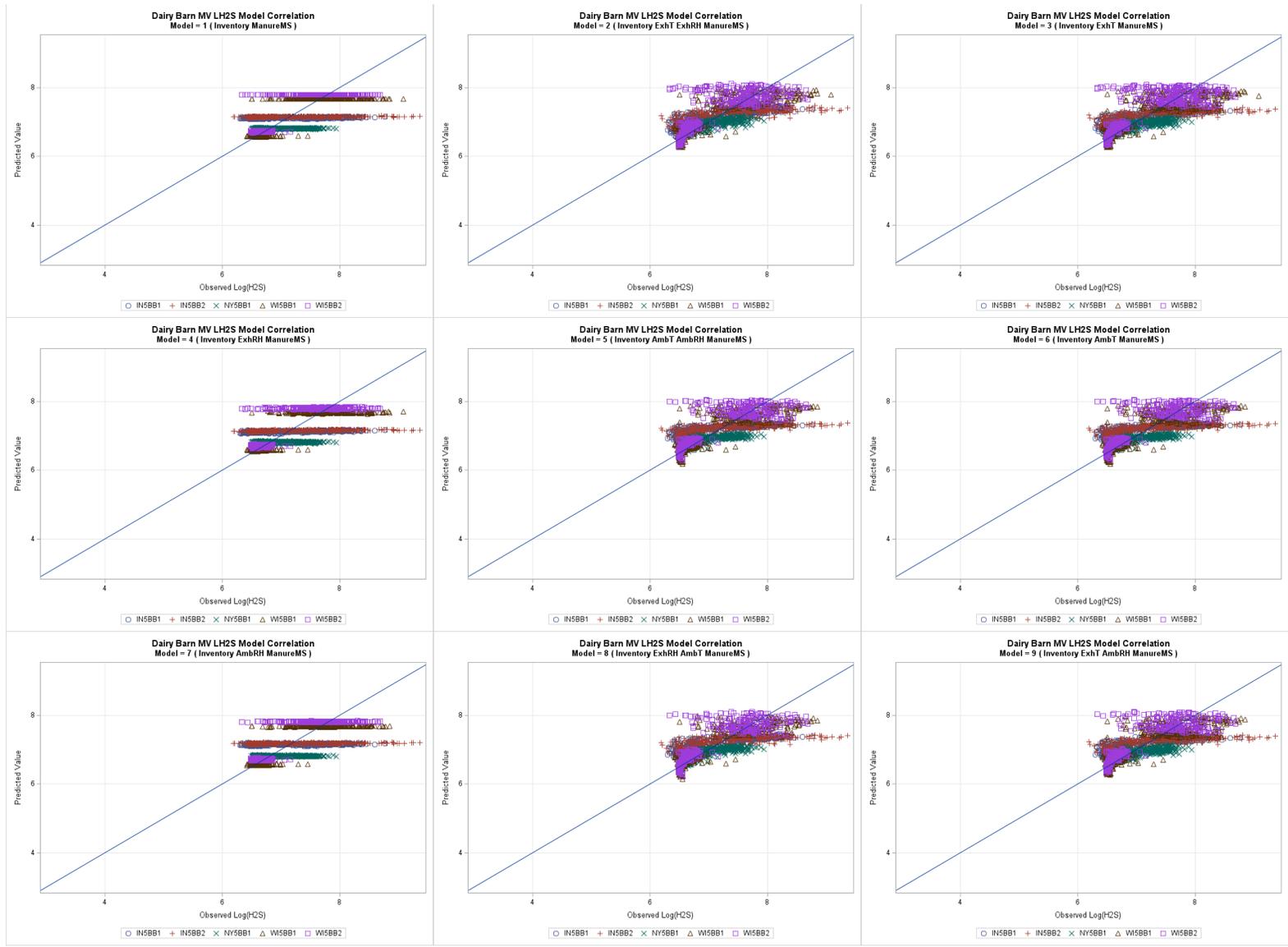


Figure G-3. Dairy mechanically ventilated barn H₂S one-to-one plots models 1 through 9, log transformed.

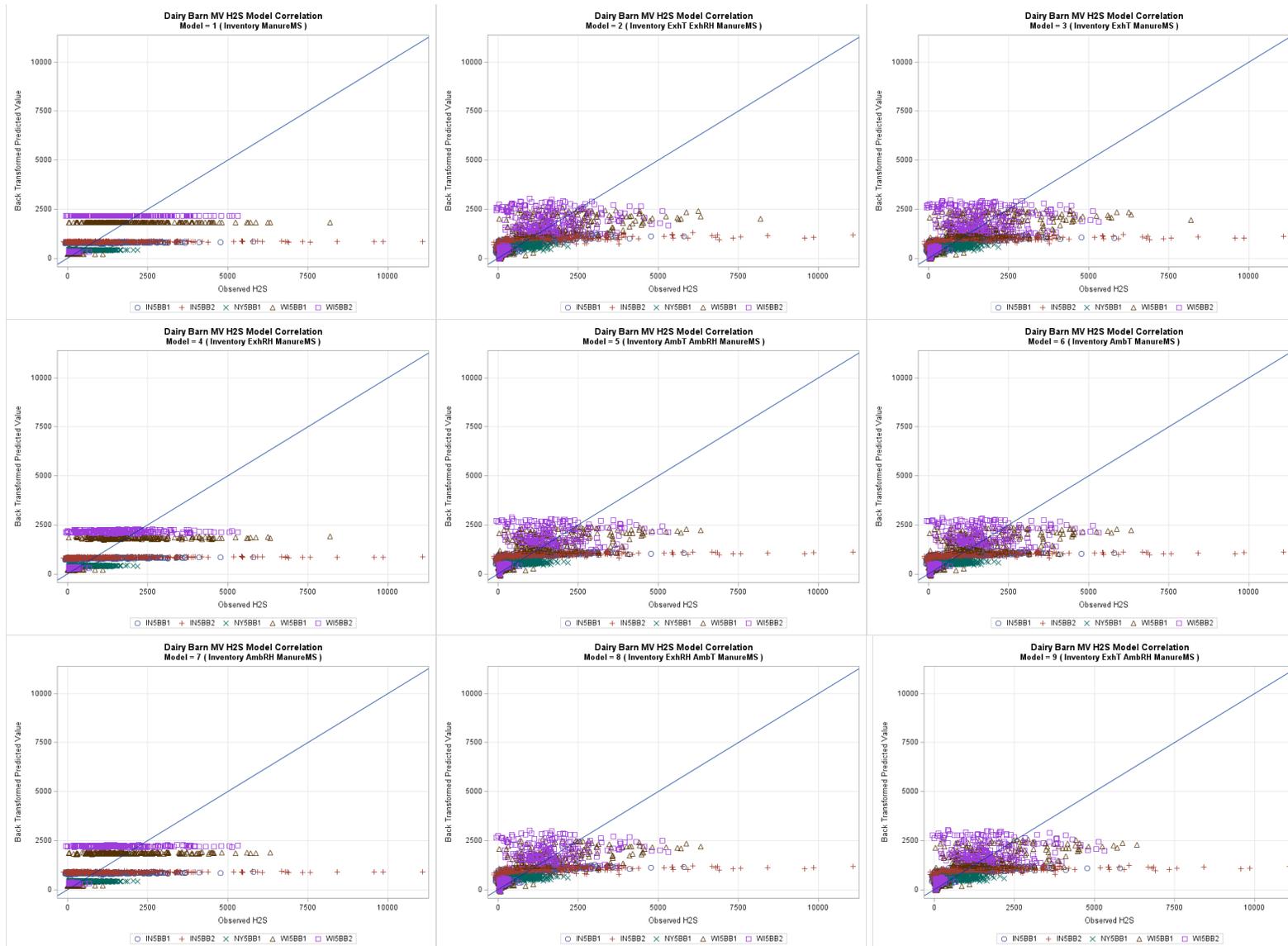


Figure G-4. Dairy mechanically ventilated barn H₂S one-to-one plots models 1 through 9, back transformed.

G.1.3 PM₁₀

Table G-7. Parameter and estimates PM₁₀ emission models for dairy mechanically ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
MVP-1	Intercept	7.893278	0.02207	<.0001
	Inventory	-0.164739	0.03776	<.0001
MVP-2	Intercept	8.000154	0.0316	<.0001
	Inventory	-0.154561	0.02763	<.0001
	Exhaust temperature	0.009357	0.00069	<.0001
	Exhaust relative humidity	-0.003067	0.00039	<.0001
MVP-3	Intercept	7.792627	0.01763	<.0001
	Inventory	-0.176717	0.02764	<.0001
	Exhaust temperature	0.009331	0.00069	<.0001
MVP-4	Intercept	8.105856	0.03512	<.0001
	Inventory	-0.149821	0.03774	0.0001
	Exhaust relative humidity	-0.003063	0.00041	<.0001
MVP-5	Intercept	7.975044	0.02594	<.0001
	Inventory	-0.19122	0.02854	<.0001
	Ambient temperature	0.006017	0.00051	<.0001
	Ambient relative humidity	-0.001883	0.00029	<.0001
MVP-6	Intercept	7.843341	0.01664	<.0001
	Inventory	-0.186495	0.02844	<.0001
	Ambient temperature	0.006236	0.00051	<.0001
MVP-7	Intercept	8.029831	0.02952	<.0001
	Inventory	-0.16347	0.03753	<.0001
	Ambient relative humidity	-0.002031	0.00029	<.0001
MVP-8	Intercept	8.027481	0.03188	<.0001
	Inventory	-0.166792	0.02878	<.0001
	Exhaust relative humidity	-0.002682	0.00041	<.0001
	Ambient temperature	0.006001	0.00051	<.0001
MVP-9	Intercept	7.936865	0.02607	<.0001
	Inventory	-0.1827	0.02753	<.0001
	Exhaust temperature	0.009106	0.00069	<.0001
	Ambient relative humidity	-0.002059	0.00028	<.0001
MVP-10	Intercept	8.249507	0.06206	<.0001
	Exhaust temperature	0.018019	0.00156	<.0001
	Exhaust relative humidity	-0.007211	0.00078	<.0001
MVP-11	Intercept	7.737968	0.02793	<.0001
	Exhaust temperature	0.01796	0.00159	<.0001
MVP-12	Intercept	8.447248	0.06301	<.0001
	Exhaust relative humidity	-0.00706	0.00081	<.0001
MVP-13	Intercept	8.130759	0.04588	<.0001
	Ambient temperature	0.01083	0.00117	<.0001
	Ambient relative humidity	-0.004322	0.00056	<.0001

Model	Parameter	Estimate	Standard Error	p-value
MVP-14	Intercept	7.835482	0.0252	<.0001
	Ambient temperature	0.011268	0.00118	<.0001
MVP-15	Intercept	8.250004	0.04677	<.0001
	Ambient relative humidity	-0.004532	0.00057	<.0001
MVP-16	Intercept	8.301634	0.06314	<.0001
	Exhaust relative humidity	-0.006477	0.00081	<.0001
	Ambient temperature	0.010627	0.00117	<.0001
MVP-17	Intercept	8.05718	0.04675	<.0001
	Exhaust temperature	0.01731	0.00158	<.0001
	Ambient relative humidity	-0.004623	0.00056	<.0001

Table G-8. Fit and evaluation statistics for PM₁₀ emission models for dairy mechanically ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
MVP-1	-2,874	-2,866	-2,866	-2,865	0.22	1.43	102.20	323.70	-0.50	-0.16
MVP-2	-2,986	-2,974	-2,974	-2,972	0.62	1.18	82.59	266.30	-7.22	-2.24
MVP-3	-3,017	-3,007	-3,007	-3,005	0.59	1.22	86.12	272.80	-6.68	-2.11
MVP-4	-2,843	-2,833	-2,833	-2,831	0.31	1.41	99.97	322.40	-1.31	-0.41
MVP-5	-2,897	-2,885	-2,885	-2,883	0.57	1.19	85.84	265.10	-5.69	-1.84
MVP-6	-2,887	-2,877	-2,877	-2,875	0.57	1.19	86.50	265.40	-5.77	-1.88
MVP-7	-2,801	-2,791	-2,791	-2,789	0.27	1.38	99.99	308.10	-0.86	-0.28
MVP-8	-2,840	-2,828	-2,828	-2,826	0.59	1.17	83.56	261.10	-6.28	-2.01
MVP-9	-2,939	-2,927	-2,927	-2,925	0.59	1.18	85.03	262.00	-5.83	-1.89
MVP-10	-818	-808	-808	-806	0.58	2.71	96.84	941.10	-70.93	-7.30
MVP-11	-724	-716	-716	-714	0.51	2.84	101.30	969.60	-58.71	-6.14
MVP-12	-700	-692	-692	-691	0.29	3.02	113.20	1,100.00	-14.42	-1.48
MVP-13	-730	-720	-720	-718	0.46	2.78	102.80	951.80	-45.14	-4.88
MVP-14	-688	-680	-680	-678	0.47	2.82	103.70	952.90	-47.53	-5.17
MVP-15	-657	-649	-649	-647	0.13	3.08	116.60	1,075.00	-1.75	-0.19
MVP-16	-764	-754	-754	-752	0.54	2.71	99.80	932.00	-58.17	-6.23
MVP-17	-766	-756	-755	-754	0.49	2.75	100.50	927.40	-51.05	-5.53

^a Based on transformed data (i.e., ln(PM₁₀)).

^b Based on back-transformed data.

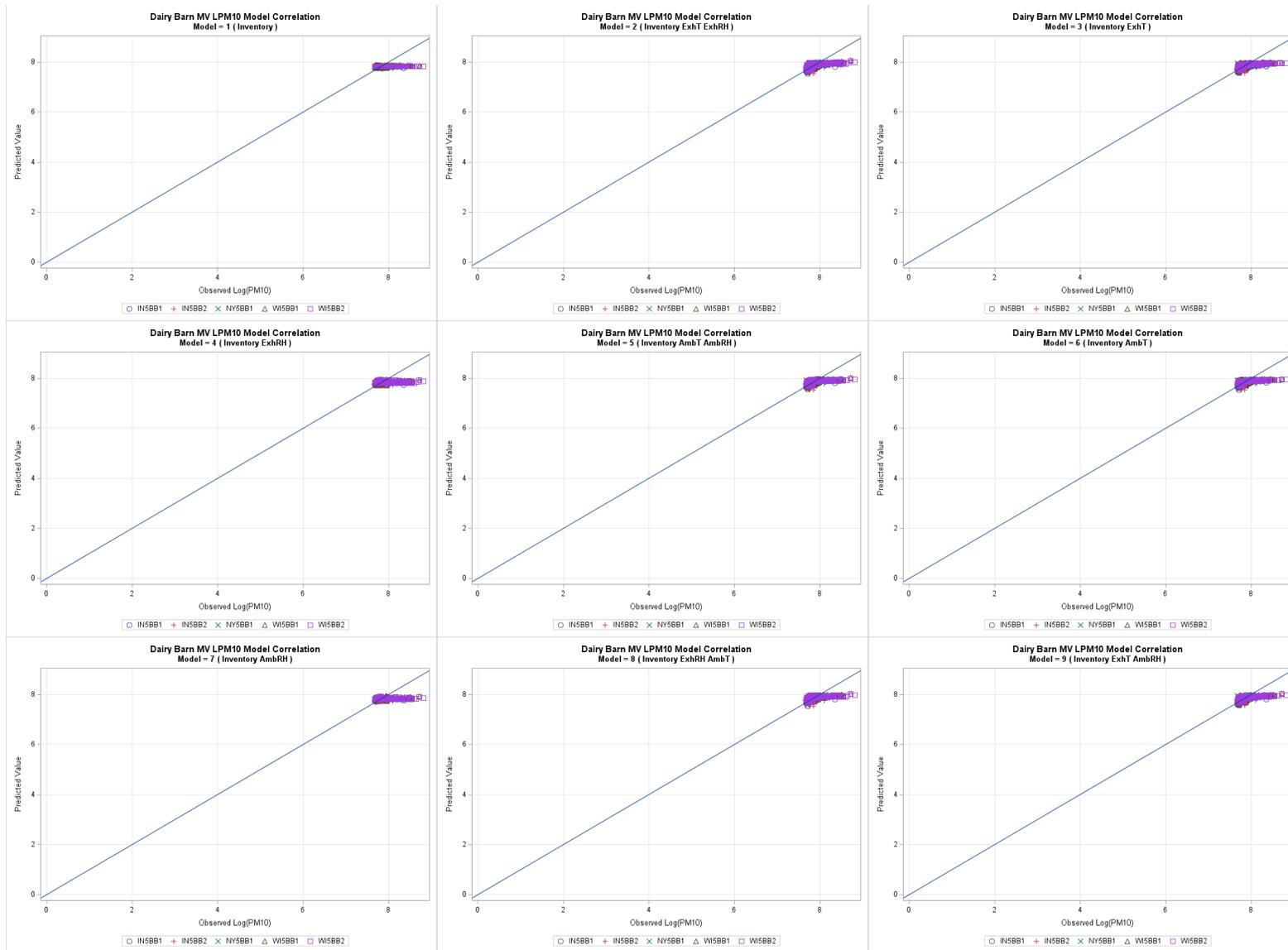


Figure G-5. Dairy mechanically ventilated barn PM₁₀ one-to-one plots models 1 through 9, log transformed.

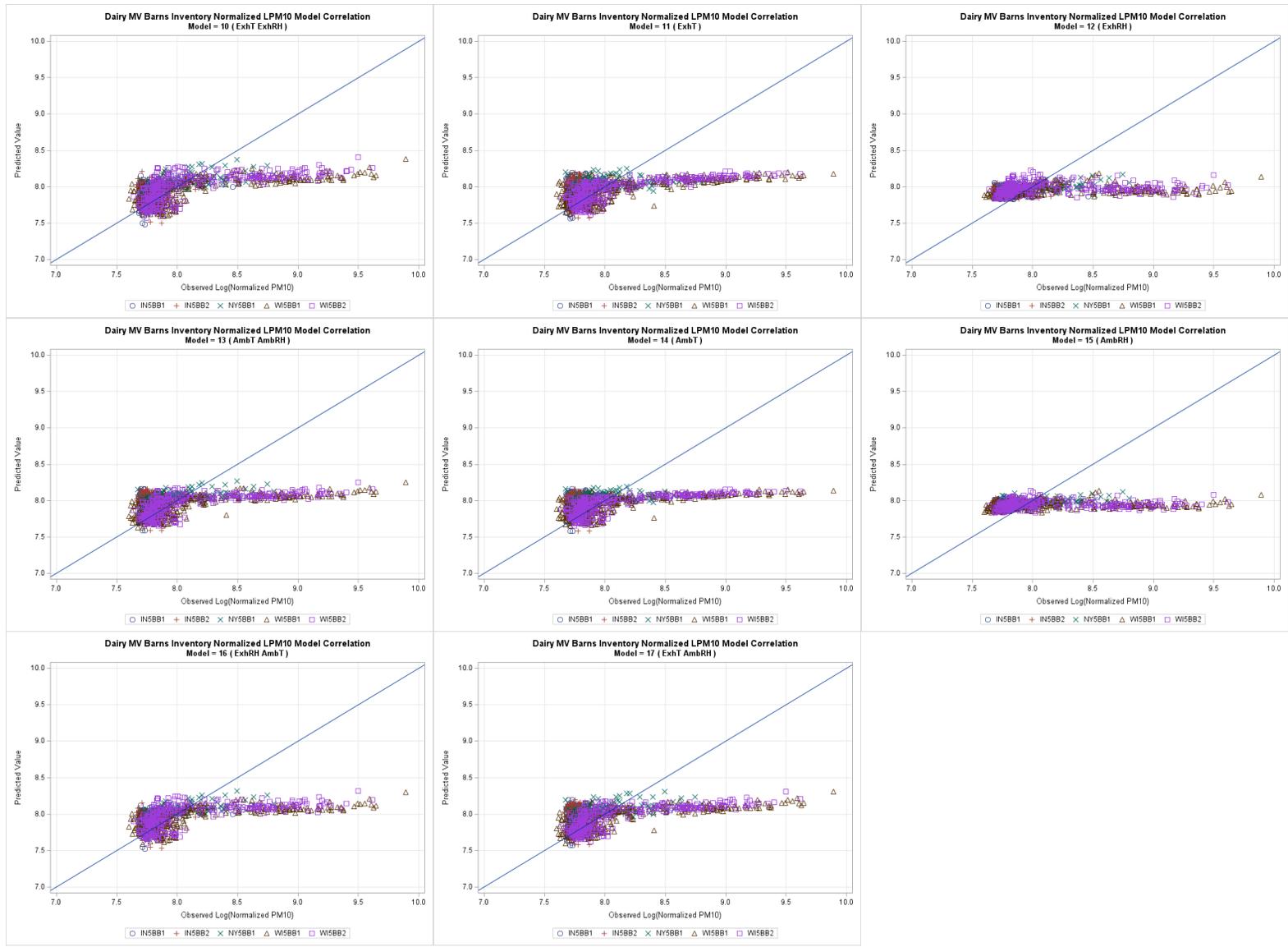


Figure G-6. Dairy mechanically ventilated barn PM₁₀ one-to-one plots models 10 through 17, log transformed.

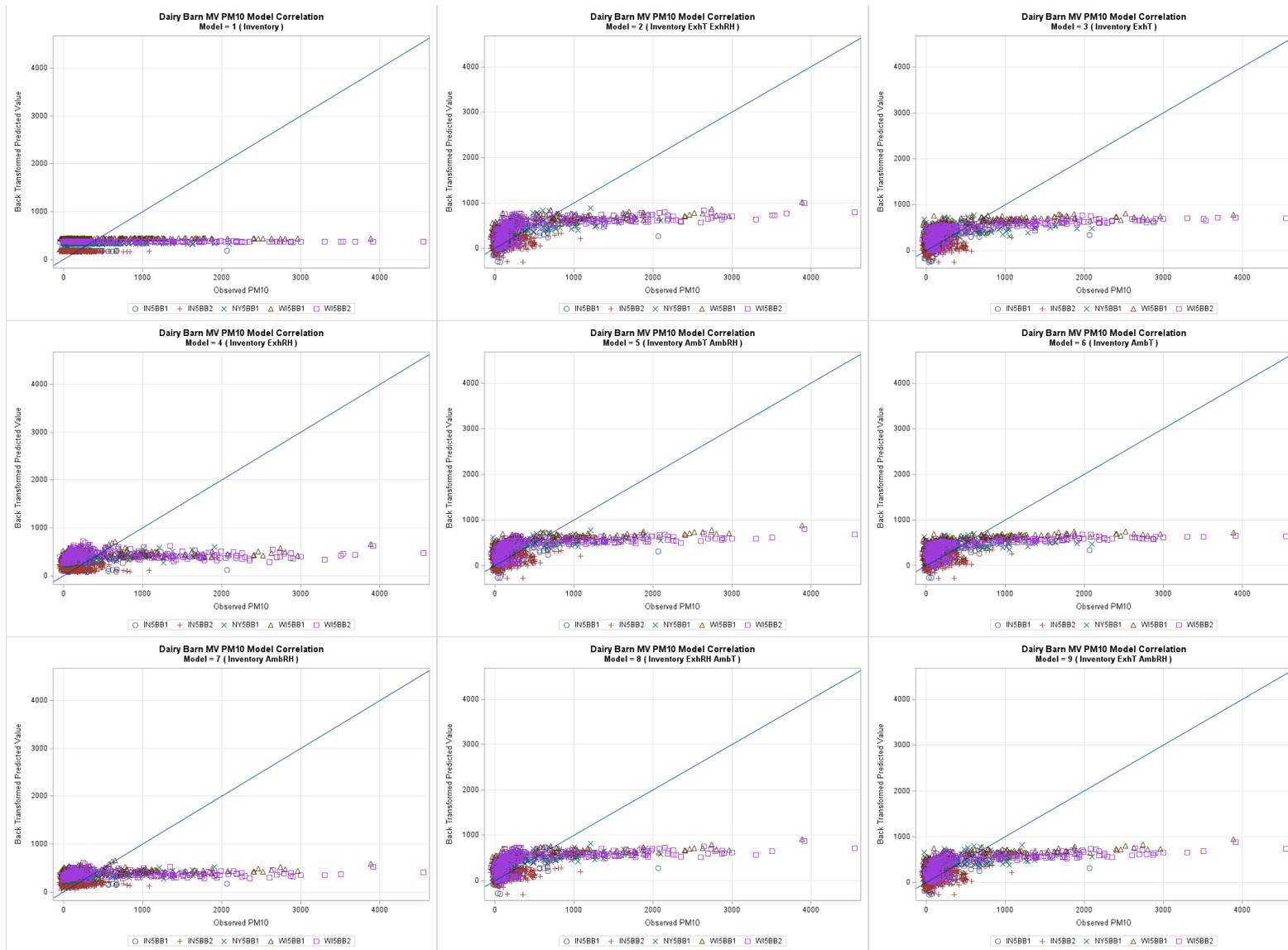


Figure G-7. Dairy mechanically ventilated barn PM₁₀ one-to-one plots models 1 through 9, back transformed.

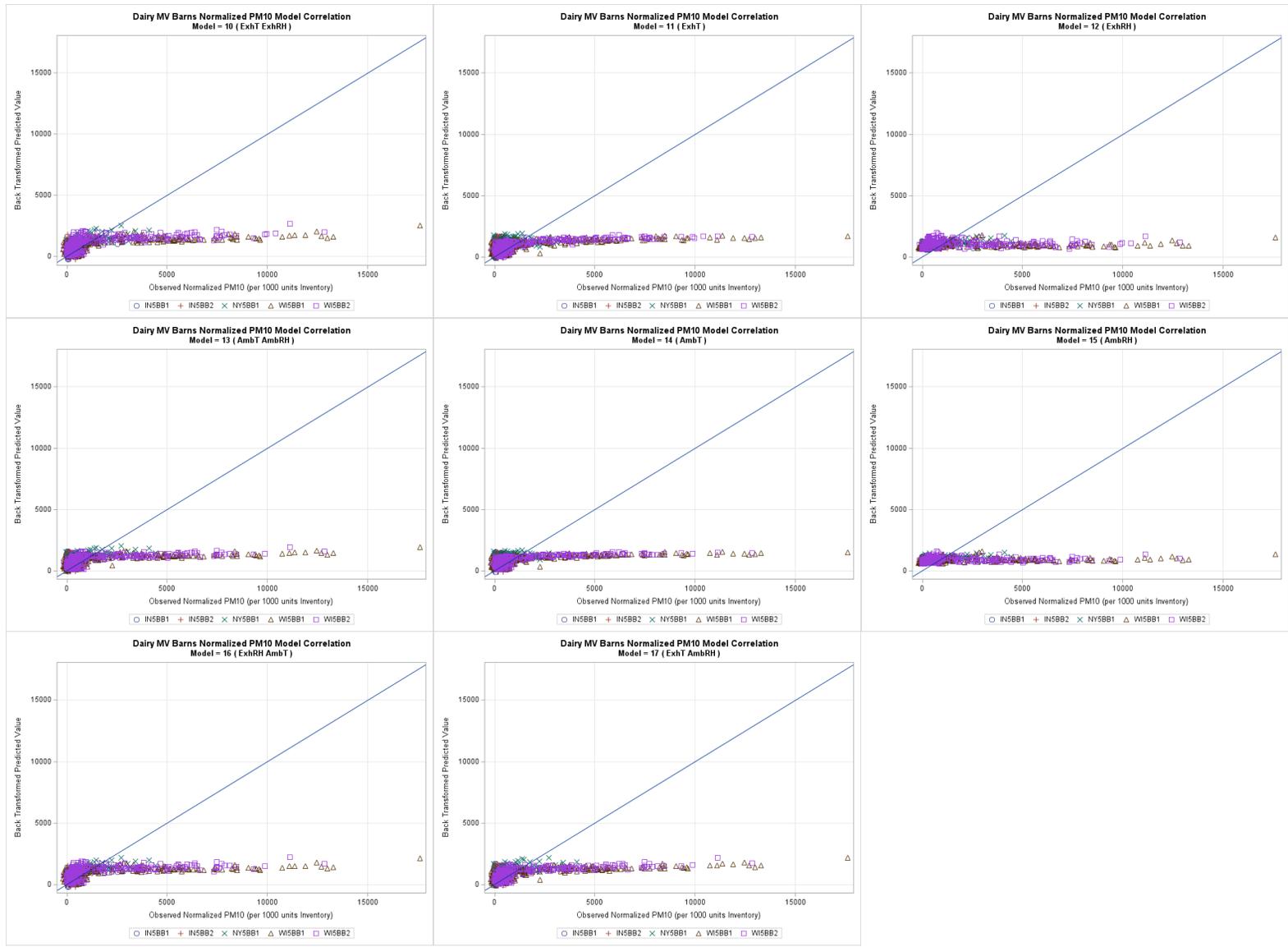


Figure G-8. Dairy mechanically ventilated barn PM₁₀ one-to-one plots models 10 through 17, back transformed.

G.1.4 Fine particulate matter (PM_{2.5})

Table G-9. Parameter and estimates PM_{2.5} emission models for dairy mechanically ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
MVP-1	Intercept	6.723444	0.05214	<.0001
	Inventory	-0.162107	0.09504	0.0991
MVP-2	Intercept	6.705085	0.11364	<.0001
	Inventory	-0.223783	0.07902	0.0079
	Exhaust temperature	0.008378	0.00169	<.0001
	Exhaust relative humidity	-0.000595	0.0015	0.6917
MVP-3	Intercept	6.639886	0.04142	<.0001
	Inventory	-0.202089	0.07244	0.0088
	Exhaust temperature	0.008704	0.00159	<.0001
MVP-4	Intercept	6.838487	0.11859	<.0001
	Inventory	-0.206677	0.09595	0.0406
	Exhaust relative humidity	-0.001078	0.00159	0.4986
MVP-5	Intercept	6.697356	0.08085	<.0001
	Inventory	-0.150216	0.07109	0.0449
	Ambient temperature	0.00381	0.001	0.0004
	Ambient relative humidity	-0.000422	0.00101	0.6764
MVP-6	Intercept	6.667655	0.03747	<.0001
	Inventory	-0.149752	0.07223	0.0477
	Ambient temperature	0.003817	0.00101	0.0004
MVP-7	Intercept	6.672905	0.08644	<.0001
	Inventory	-0.076468	0.08704	0.3894
	Ambient relative humidity	-0.00009	0.00102	0.9295
MVP-8	Intercept	6.656394	0.10911	<.0001
	Inventory	-0.200477	0.08068	0.0195
	Exhaust relative humidity	0.000576	0.00147	0.6967
	Ambient temperature	0.003939	0.0011	0.0008
MVP-9	Intercept	6.65579	0.08022	<.0001
	Inventory	-0.149074	0.06841	0.039
	Exhaust temperature	0.006647	0.00145	<.0001
	Ambient relative humidity	-0.000437	0.00099	0.6602
MVP-10	Intercept	6.734071	0.2477	<.0001
	Exhaust temperature	0.018344	0.00461	0.0002
	Exhaust relative humidity	-0.001841	0.00313	0.5567
MVP-11	Intercept	6.607057	0.07549	<.0001
	Exhaust temperature	0.016971	0.00434	0.0002
MVP-12	Intercept	6.945997	0.25138	<.0001
	Exhaust relative humidity	-0.001699	0.00326	0.603
MVP-13	Intercept	6.76777	0.15722	<.0001
	Ambient temperature	0.00474	0.00273	0.0872
	Ambient relative humidity	-0.000547	0.00207	0.7919

Model	Parameter	Estimate	Standard Error	p-value
MVP-14	Intercept	6.72987	0.06275	<.0001
	Ambient temperature	0.004738	0.00274	0.0878
MVP-15	Intercept	6.803706	0.15669	<.0001
	Ambient relative humidity	-0.000454	0.00207	0.8267
MVP-16	Intercept	6.640063	0.24227	<.0001
	Exhaust relative humidity	0.001234	0.00305	0.6865
	Ambient temperature	0.005929	0.00301	0.0528
MVP-17	Intercept	6.689929	0.159	<.0001
	Exhaust temperature	0.01113	0.00397	0.0063
	Ambient relative humidity	-0.000642	0.00204	0.7532

Table G-10. Fit and evaluation statistics for PM_{2.5} emission models for dairy mechanically ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
MVP-1	-338	-330	-330	-328	0.19	1.75	90.89	101.00	0.07	0.06
MVP-2	-340	-328	-328	-326	0.57	1.47	70.94	83.19	-0.25	-0.22
MVP-3	-363	-353	-353	-351	0.57	1.45	73.38	81.53	-0.51	-0.46
MVP-4	-318	-308	-307	-306	0.31	1.74	85.29	100.00	-0.10	-0.08
MVP-5	-369	-357	-356	-354	0.52	1.29	80.29	69.43	-0.70	-0.81
MVP-6	-369	-359	-358	-357	0.51	1.31	81.34	70.33	-0.62	-0.71
MVP-7	-357	-347	-346	-345	0.08	1.43	90.73	78.45	0.03	0.03
MVP-8	-343	-331	-331	-329	0.49	1.35	78.93	72.74	-0.36	-0.39
MVP-9	-375	-363	-362	-360	0.55	1.26	78.22	67.64	-0.54	-0.62
MVP-10	-60	-50	-50	-48	0.44	4.10	93.30	342.50	-5.74	-1.56
MVP-11	-65	-57	-56	-55	0.43	4.04	96.72	336.20	-7.30	-2.10
MVP-12	-44	-36	-36	-35	0.53	4.07	101.90	374.20	-3.30	-0.90
MVP-13	-109	-99	-98	-97	0.33	3.23	101.80	258.00	-4.87	-1.92
MVP-14	-109	-101	-100	-99	0.31	3.25	102.40	259.40	-4.33	-1.71
MVP-15	-106	-98	-97	-96	0.39	3.24	104.60	265.20	-0.52	-0.21
MVP-16	-102	-92	-92	-90	0.23	3.44	102.00	275.80	-1.57	-0.58
MVP-17	-114	-104	-103	-102	0.37	3.25	100.70	255.10	-4.98	-1.96

^a Based on transformed data (i.e., ln(PM_{2.5})).

^b Based on back-transformed data.

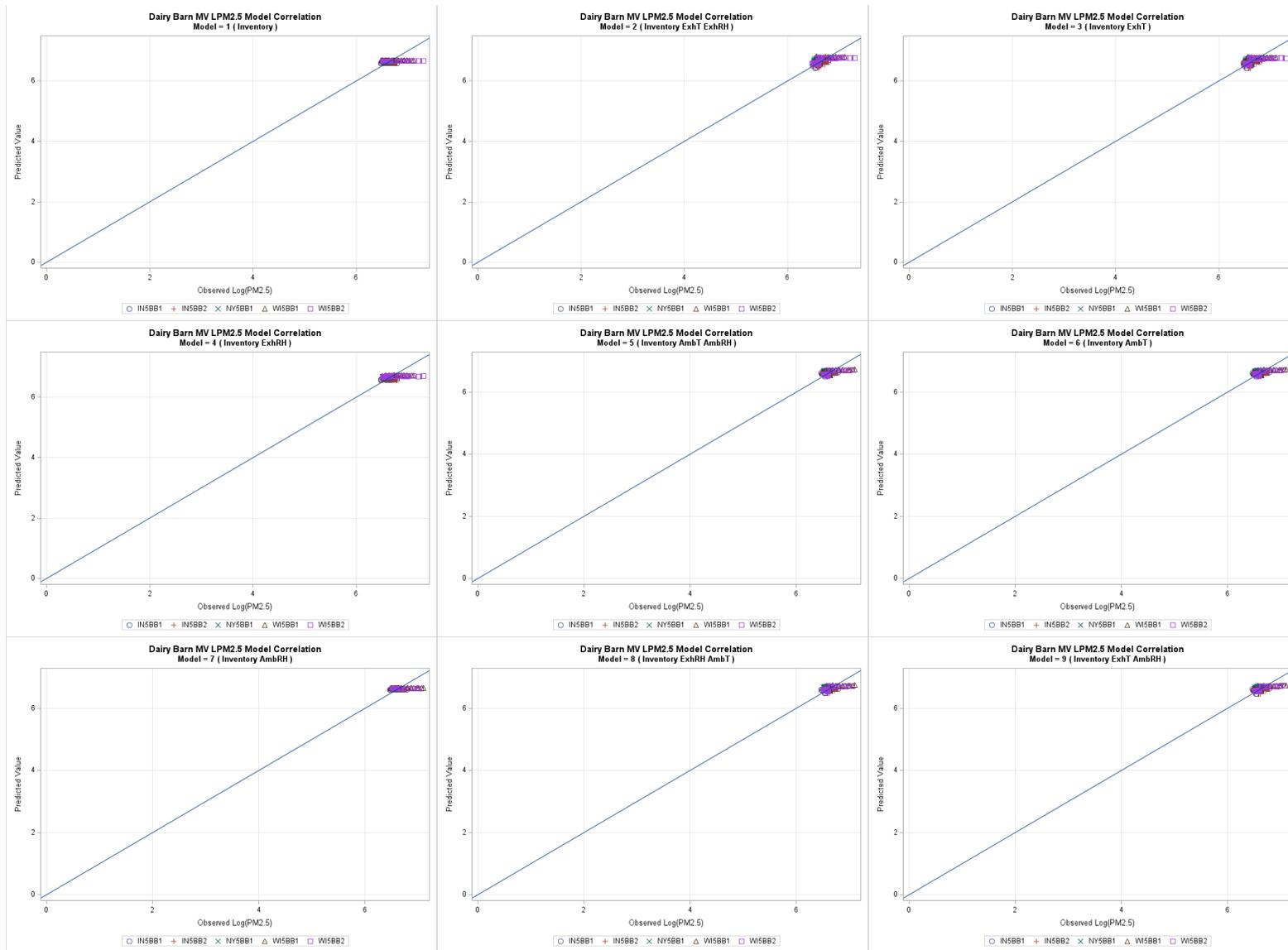


Figure G-9. Dairy mechanically ventilated barn PM_{2.5} one-to-one plots models 1 through 9, log transformed.

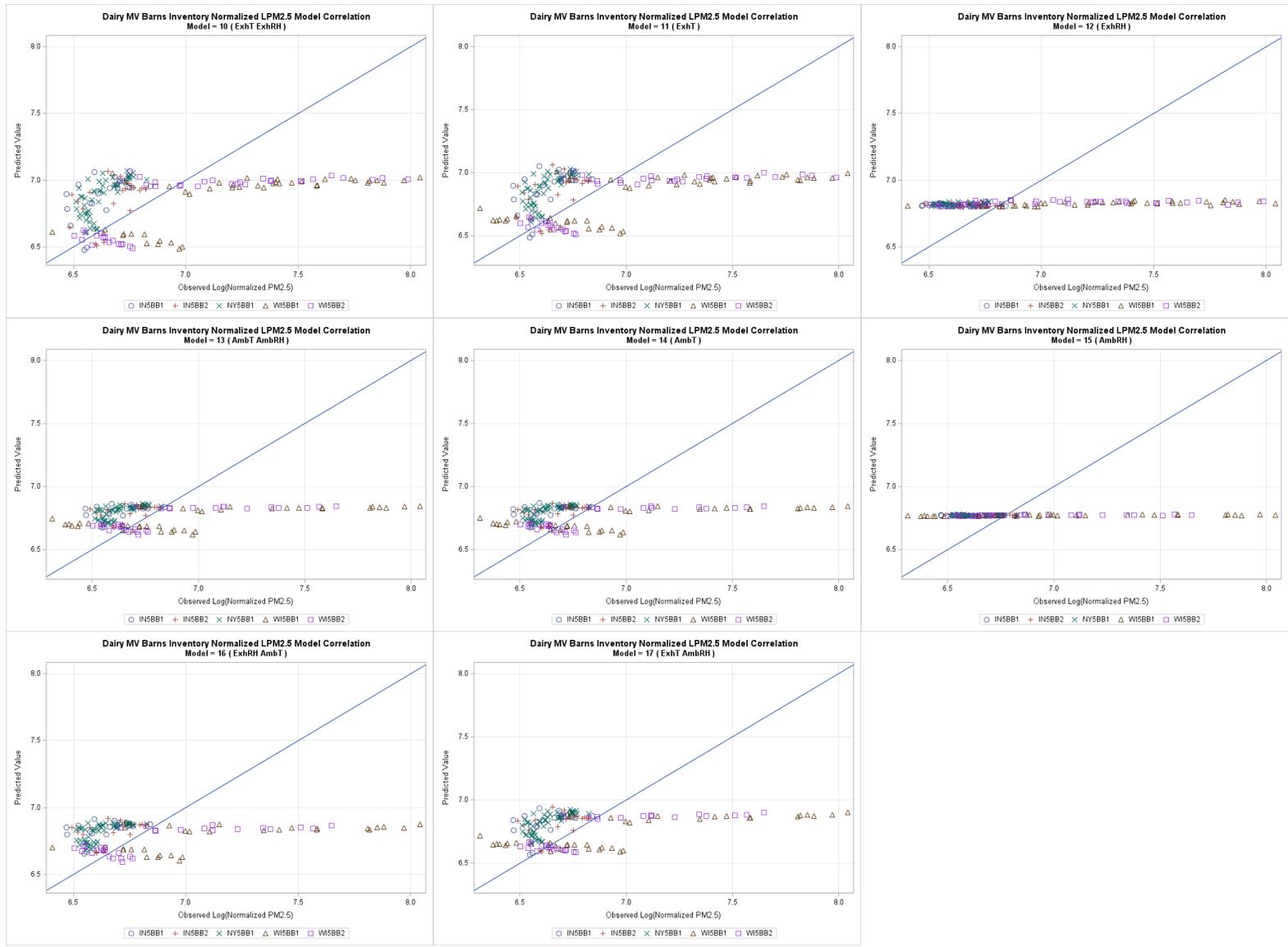


Figure G-10. Dairy mechanically ventilated barn PM_{2.5} one-to-one plots models 10 through 17, log transformed.

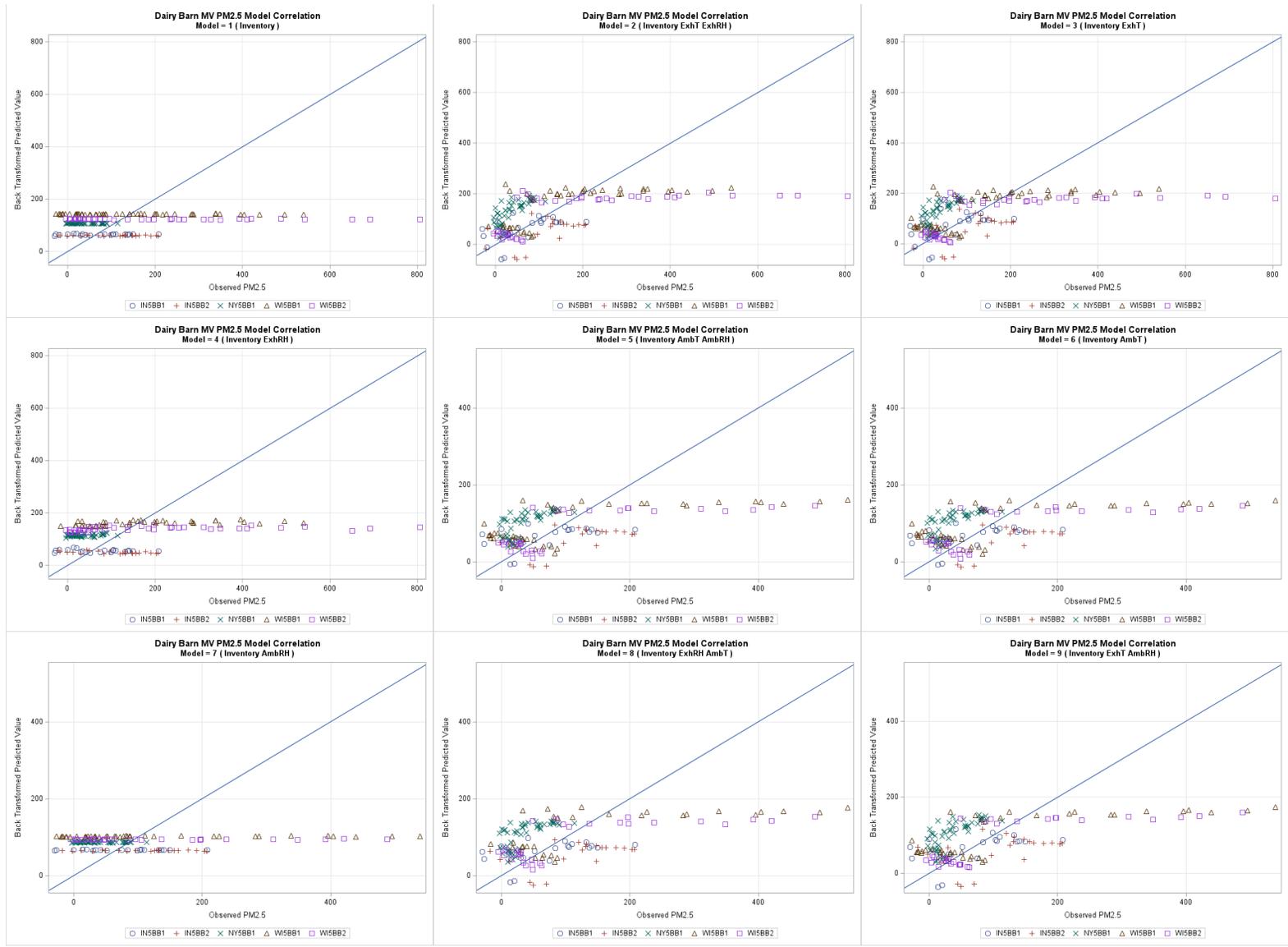


Figure G-11. Dairy mechanically ventilated barn PM_{2.5} one-to-one plots models 1 through 9, back transformed.

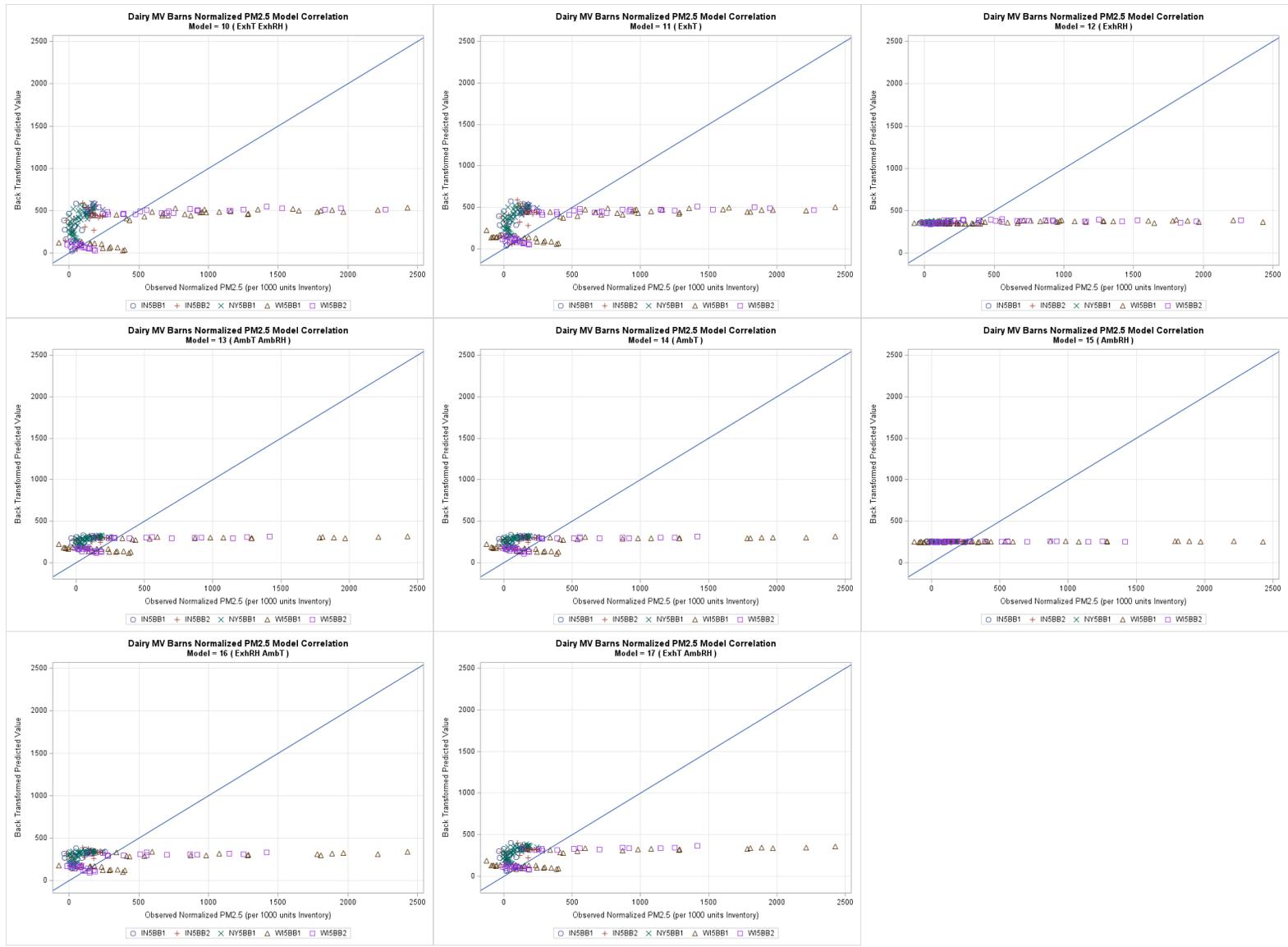


Figure G-12. Dairy mechanically ventilated barn PM_{2.5} one-to-one plots models 10 through 17, back transformed.

G.1.5 Total Suspended Particulates (TSP)

Table G-11. Parameter and estimates TSP emission models for dairy mechanically ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
MVP-1	Intercept	7.506149	0.07383	<.0001
	Inventory	-0.426276	0.12654	0.0013
MVP-2	Intercept	8.080847	0.12835	<.0001
	Inventory	-0.266376	0.10963	0.0178
	Exhaust temperature	0.015445	0.00297	<.0001
	Exhaust relative humidity	-0.011664	0.00178	<.0001
MVP-3	Intercept	7.358078	0.07017	<.0001
	Inventory	-0.436108	0.10746	0.0001
	Exhaust temperature	0.014361	0.00303	<.0001
MVP-4	Intercept	8.210417	0.13518	<.0001
	Inventory	-0.278826	0.12623	0.0308
	Exhaust relative humidity	-0.011042	0.00185	<.0001
MVP-5	Intercept	7.857034	0.11335	<.0001
	Inventory	-0.389323	0.1128	0.001
	Ambient temperature	0.008795	0.00219	<.0001
	Ambient relative humidity	-0.006738	0.00139	<.0001
MVP-6	Intercept	7.409806	0.06478	<.0001
	Inventory	-0.404463	0.10961	0.0005
	Ambient temperature	0.009577	0.00219	<.0001
MVP-7	Intercept	7.939351	0.11744	<.0001
	Inventory	-0.352971	0.1263	0.0071
	Ambient relative humidity	-0.007146	0.00141	<.0001
MVP-8	Intercept	8.090359	0.12981	<.0001
	Inventory	-0.254138	0.11268	0.0276
	Exhaust relative humidity	-0.010719	0.0018	<.0001
	Ambient temperature	0.009293	0.00217	<.0001
MVP-9	Intercept	7.796195	0.11451	<.0001
	Inventory	-0.368408	0.11077	0.0015
	Exhaust temperature	0.014024	0.00303	<.0001
	Ambient relative humidity	-0.007089	0.00138	<.0001
MVP-10	Intercept	8.975691	0.21501	<.0001
	Exhaust temperature	0.027785	0.0056	<.0001
	Exhaust relative humidity	-0.023121	0.00293	<.0001
MVP-11	Intercept	7.431124	0.09737	<.0001
	Exhaust temperature	0.020482	0.00614	0.001
MVP-12	Intercept	9.111458	0.22141	<.0001
	Exhaust relative humidity	-0.020799	0.00299	<.0001
MVP-13	Intercept	8.434953	0.17254	<.0001
	Ambient temperature	0.01277	0.00439	0.004
	Ambient relative humidity	-0.013417	0.0023	<.0001

Model	Parameter	Estimate	Standard Error	p-value
MVP-14	Intercept	7.539927	0.08173	<.0001
	Ambient temperature	0.013471	0.00453	0.0033
MVP-15	Intercept	8.546104	0.1713	<.0001
	Ambient relative humidity	-0.0135	0.00231	<.0001
MVP-16	Intercept	9.009825	0.21894	<.0001
	Exhaust relative humidity	-0.021338	0.00297	<.0001
	Ambient temperature	0.016536	0.00418	0.0001
MVP-17	Intercept	8.338173	0.17488	<.0001
	Exhaust temperature	0.023054	0.00598	0.0001
	Ambient relative humidity	-0.014012	0.00228	<.0001

Table G-12. Fit and evaluation statistics for TSP emission models for dairy mechanically ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
MVP-1	-39	-31	-31	-30	0.36	3.43	76.20	452.20	-7.27	-1.23
MVP-2	-100	-88	-88	-85	0.58	3.12	65.73	392.90	-10.15	-1.70
MVP-3	-59	-49	-49	-47	0.52	3.29	69.78	414.10	-13.38	-2.25
MVP-4	-75	-65	-65	-63	0.45	3.21	72.38	432.70	-5.15	-0.86
MVP-5	-74	-62	-62	-60	0.48	3.20	70.42	403.60	-7.64	-1.33
MVP-6	-52	-42	-42	-40	0.48	3.20	70.09	401.70	-10.53	-1.84
MVP-7	-60	-50	-49	-48	0.35	3.28	74.49	426.90	-3.09	-0.54
MVP-8	-87	-75	-74	-72	0.54	3.07	66.61	384.80	-8.25	-1.43
MVP-9	-79	-67	-67	-65	0.49	3.20	70.07	401.60	-7.09	-1.24
MVP-10	236	246	246	248	0.57	5.76	80.77	1,507.00	-161.40	-8.65
MVP-11	310	318	318	320	0.37	6.77	93.60	1,735.00	-119.00	-6.42
MVP-12	260	268	268	269	0.42	6.12	93.23	1,740.00	-54.94	-2.94
MVP-13	270	280	281	282	0.31	6.41	92.68	1,628.00	-66.13	-3.77
MVP-14	303	311	311	312	0.31	6.63	94.21	1,655.00	-86.80	-4.94
MVP-15	279	287	287	288	0.15	6.57	99.61	1,749.00	13.17	0.75
MVP-16	237	247	247	249	0.52	5.73	82.91	1,466.00	-125.10	-7.08
MVP-17	264	274	274	276	0.36	6.36	90.45	1,589.00	-85.82	-4.89

^a Based on transformed data (i.e., ln(TSP)).

^b Based on back-transformed data.

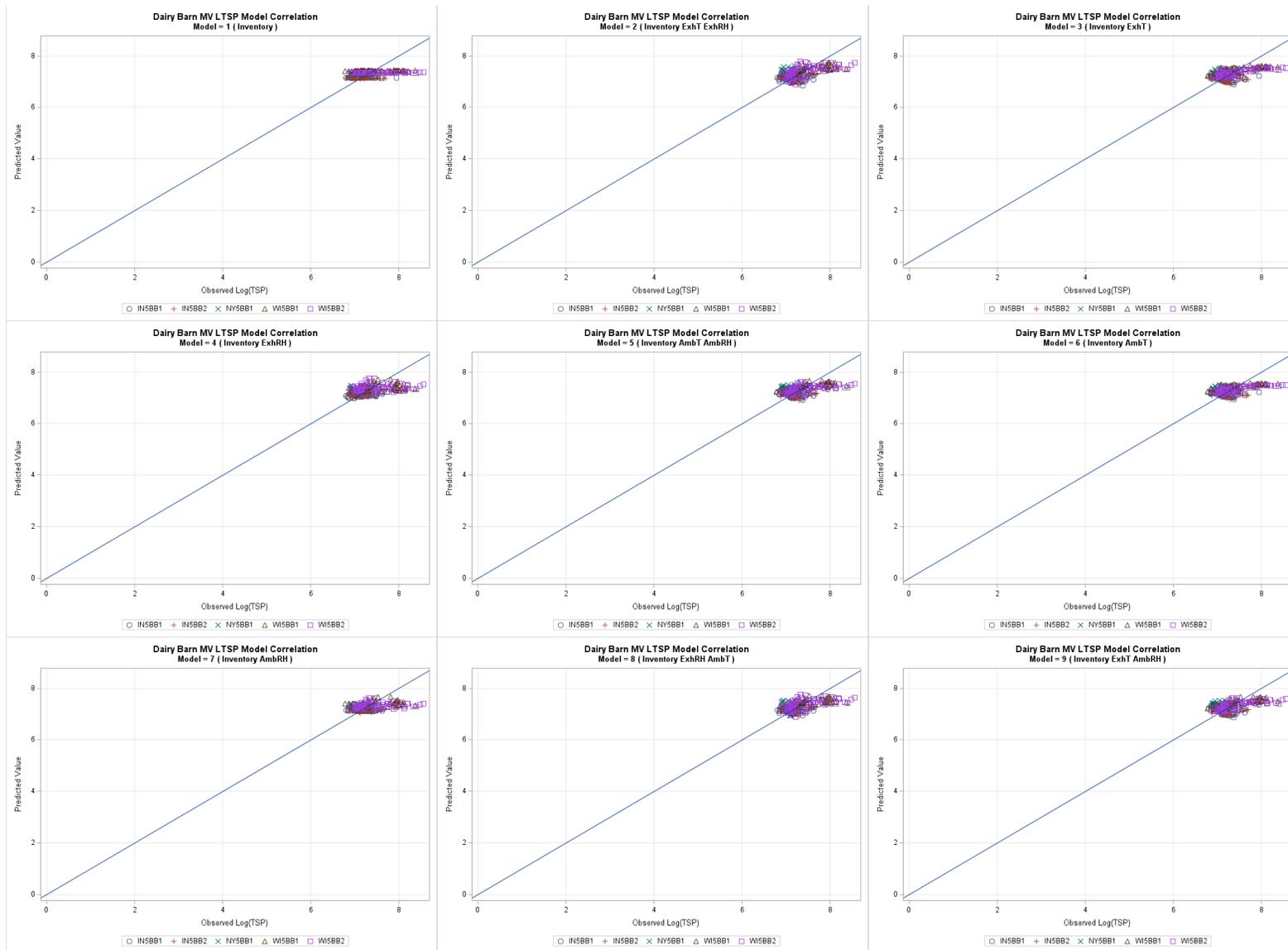


Figure G-13. Dairy mechanically ventilated barn TSP one-to-one plots models 1 through 9, log transformed.

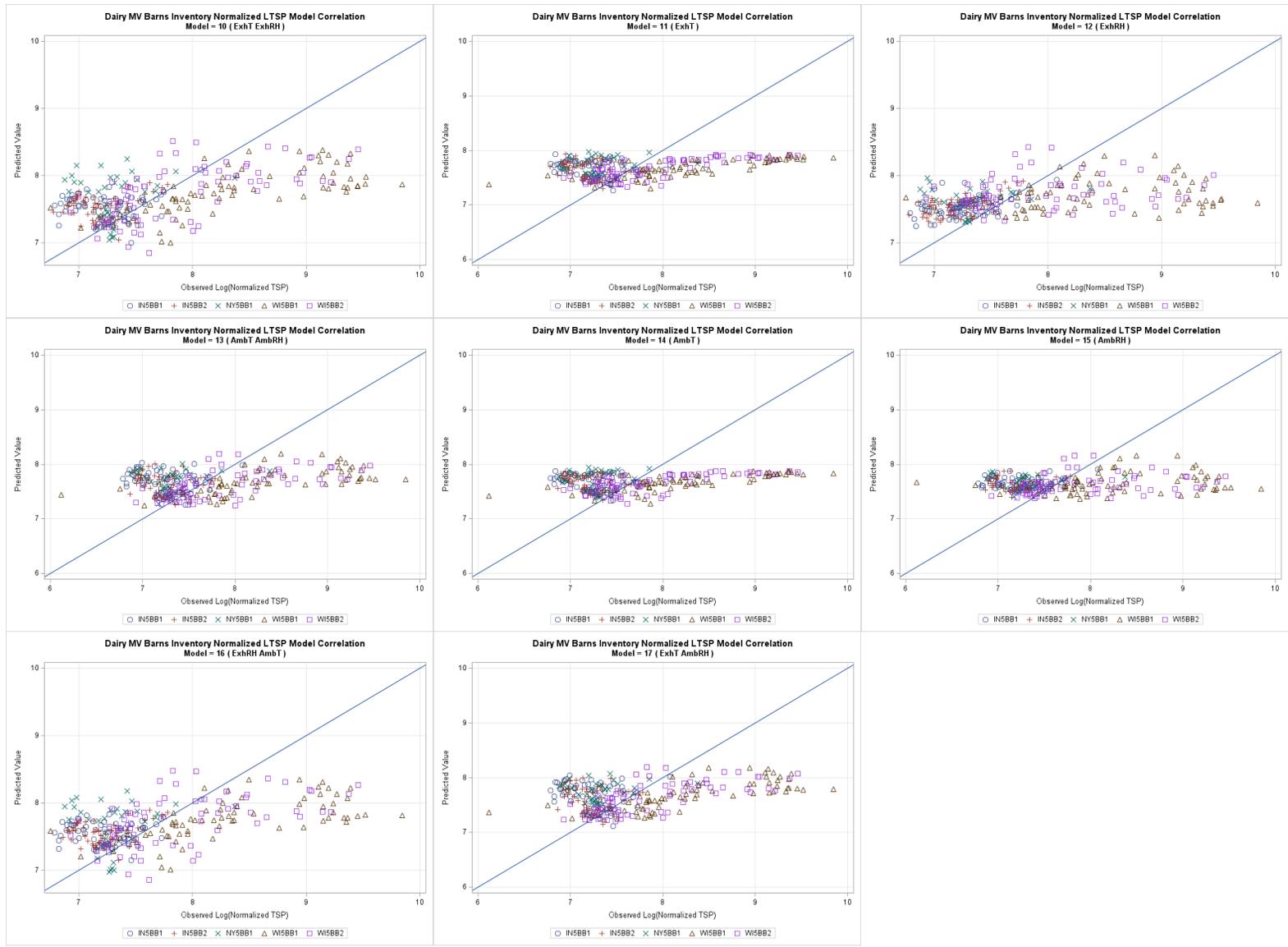


Figure G-14. Dairy mechanically ventilated barn TSP one-to-one plots models 10 through 17, log transformed.

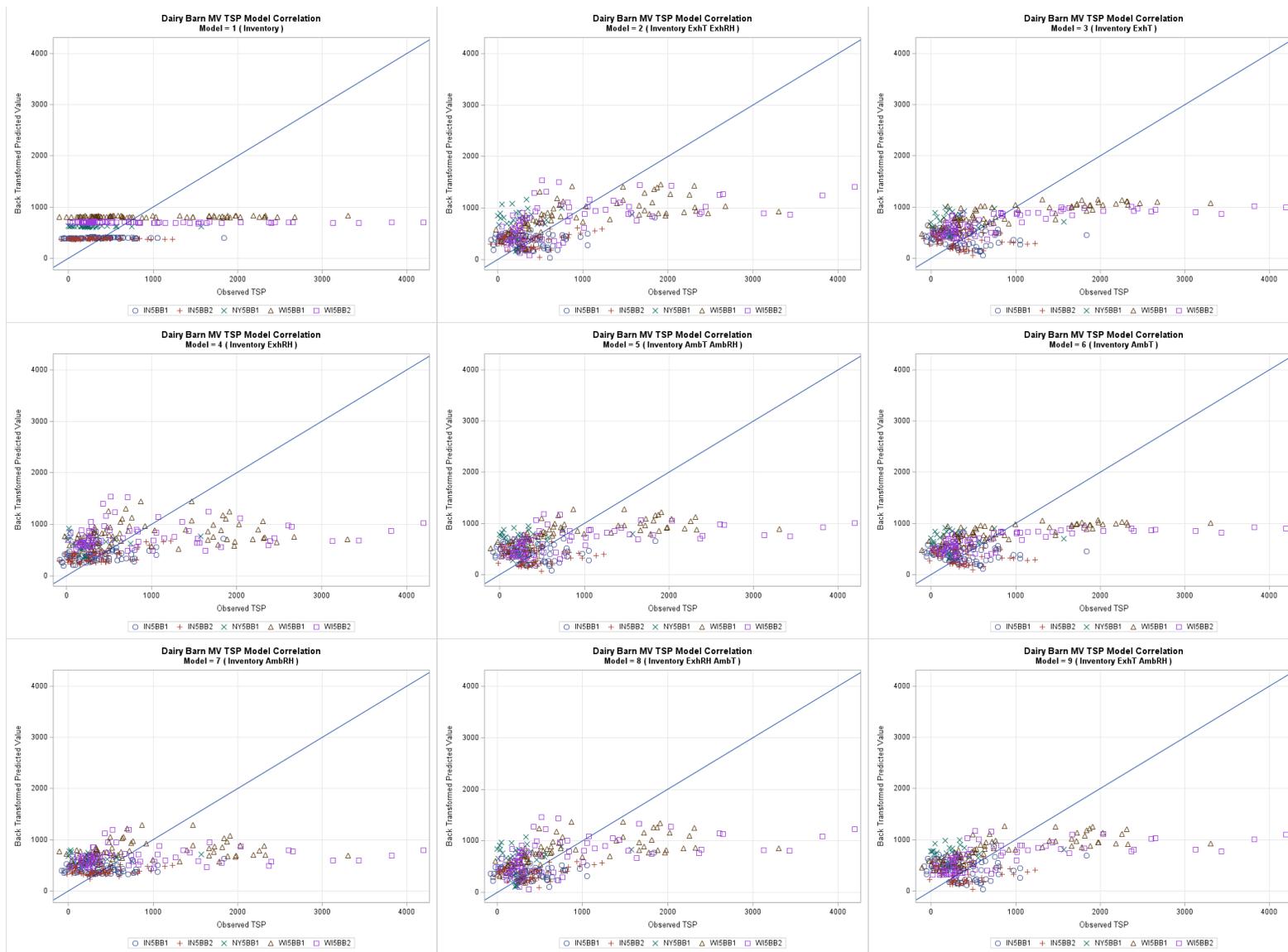


Figure G-15. Dairy mechanically ventilated barn TSP one-to-one plots models 1 through 9, back transformed.

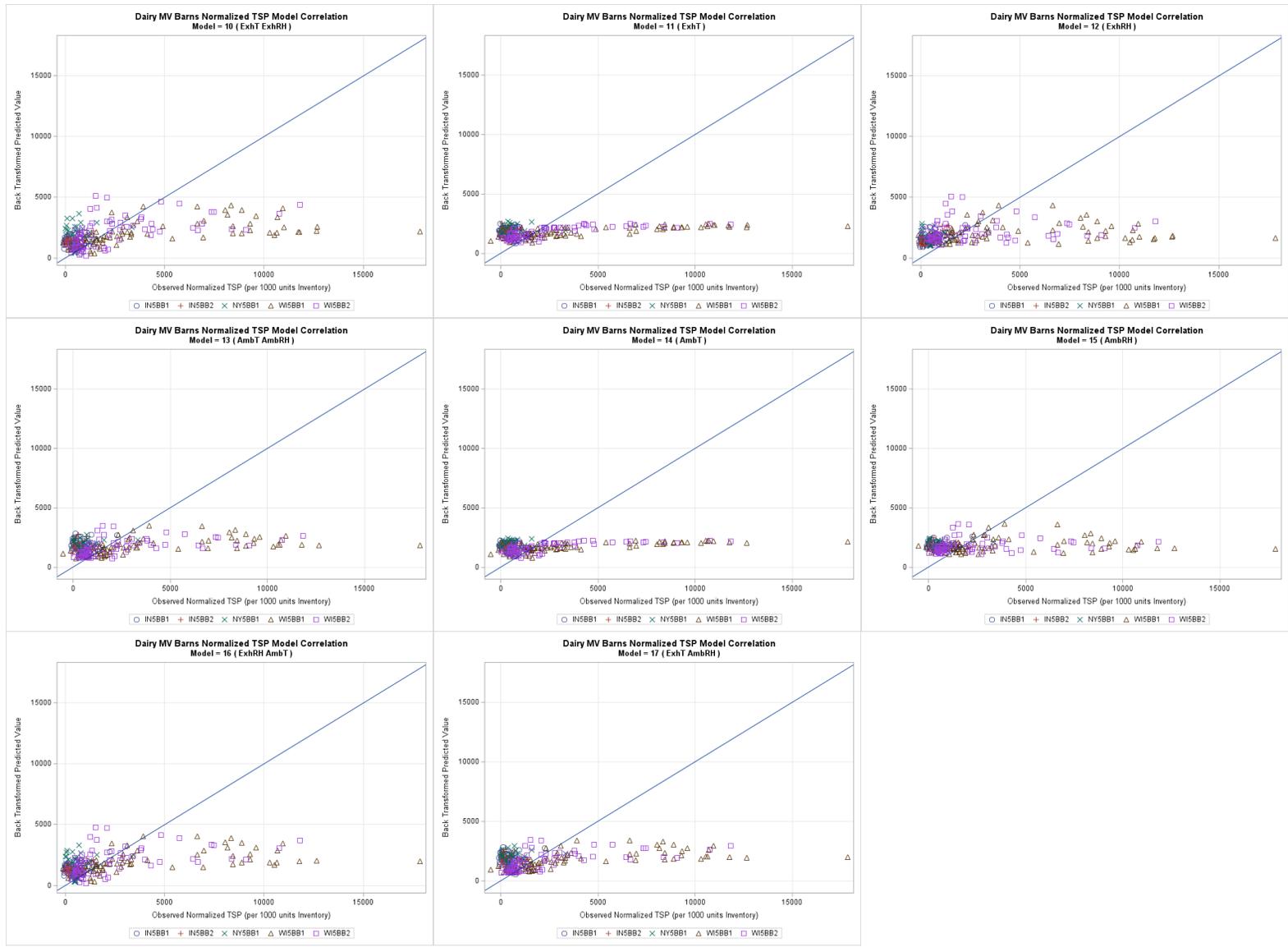


Figure G-16. Dairy mechanically ventilated barn TSP one-to-one plots models 1 through 9, back transformed.

G.2 Milking Centers

G.2.1 Ammonia (NH₃)

Table G-13. Parameter and estimates NH₃ emission models for dairy milking centers.

Model	Parameter	Estimate	Standard Error	p-value
MC-1	Intercept	1.208525	0.8987	0.1802
	Inventory	0	.	.
	Milk Production	0.017805	0.02543	0.4848
	Exhaust temperature	0.0238	0.00339	<.0001
	Exhaust relative humidity	0.000102	0.00144	0.9434
MC-2	Intercept	0.897337	0.76585	0.2424
	Inventory	0	.	.
	Milk Production	0.024322	0.02166	0.2626
	Exhaust temperature	0.030704	0.00286	<.0001
MC-3	Intercept	1.652131	0.89508	0.0669
	Inventory	0	.	.
	Milk Production	0.018111	0.02522	0.4739
	Exhaust relative humidity	-0.00155	0.00155	0.3188
MC-4	Intercept	0.838636	0.80156	0.2965
	Inventory	0	.	.
	Milk Production	0.028606	0.02269	0.2087
	Ambient temperature	0.019551	0.00209	<.0001
	Ambient relative humidity	0.001192	0.00087	0.1697
MC-5	Intercept	0.829125	0.80015	0.3012
	Inventory	0	.	.
	Milk Production	0.031273	0.02257	0.1674
	Ambient temperature	0.019256	0.00208	<.0001
MC-6	Intercept	1.548428	0.80445	0.056
	Inventory	0	.	.
	Milk Production	0.015087	0.02273	0.5079
	Ambient relative humidity	0.000923	0.00099	0.3531
MC-7	Intercept	1.120794	0.94412	0.2367
	Inventory	0	.	.
	Milk Production	0.022857	0.02672	0.3935
	Exhaust relative humidity	0.000694	0.00152	0.6489
	Ambient temperature	0.015329	0.00252	<.0001
MC-8	Intercept	0.774798	0.79271	0.3292
	Inventory	0	.	.
	Milk Production	0.025147	0.02248	0.2642
	Exhaust temperature	0.032583	0.00296	<.0001
	Ambient relative humidity	0.001034	0.00083	0.2133
MC-9	Intercept	0.804663	0.15646	<.0001
	Inventory	0.18583	0.25045	0.4624

Model	Parameter	Estimate	Standard Error	p-value
	Exhaust temperature	0.051146	0.00368	<.0001
	Exhaust relative humidity	0.008179	0.00146	<.0001
MC-10	Intercept	1.433197	0.11131	<.0001
	Inventory	0.088677	0.25075	0.7254
	Exhaust temperature	0.053704	0.00331	<.0001
MC-11	Intercept	1.346365	0.17597	<.0001
	Inventory	0.263579	0.29536	0.3772
	Exhaust relative humidity	0.010509	0.00166	<.0001
MC-12	Intercept	1.406205	0.13211	<.0001
	Inventory	0.210045	0.25239	0.41
	Ambient temperature	0.035077	0.00241	<.0001
	Ambient relative humidity	0.00438	0.00107	<.0001
MC-13	Intercept	1.718316	0.10593	<.0001
	Inventory	0.191352	0.24706	0.4428
	Ambient temperature	0.034376	0.00242	<.0001
MC-14	Intercept	1.823354	0.15017	<.0001
	Inventory	0.409915	0.29689	0.1744
	Ambient relative humidity	0.003493	0.00122	0.0043
MC-15	Intercept	1.004861	0.15587	<.0001
	Inventory	0.272607	0.24764	0.2771
	Exhaust relative humidity	0.009201	0.00152	<.0001
	Ambient temperature	0.032845	0.00267	<.0001
MC-16	Intercept	1.197532	0.13428	<.0001
	Inventory	0.090108	0.25633	0.727
	Exhaust temperature	0.054912	0.00335	<.0001
	Ambient relative humidity	0.003251	0.00104	0.0018
MC-17	Intercept	1.208525	0.8987	0.1802
	Milk Production	0.017805	0.02543	0.4848
	Exhaust temperature	0.0238	0.00339	<.0001
	Exhaust relative humidity	0.000102	0.00144	0.9434
MC-18	Intercept	0.897337	0.76585	0.2424
	Milk Production	0.024322	0.02166	0.2626
	Exhaust temperature	0.030704	0.00286	<.0001
MC-19	Intercept	1.652131	0.89508	0.0669
	Milk Production	0.018111	0.02522	0.4739
	Exhaust relative humidity	-0.00155	0.00155	0.3188
MC-20	Intercept	0.838636	0.80156	0.2965
	Milk Production	0.028606	0.02269	0.2087
	Ambient temperature	0.019551	0.00209	<.0001
	Ambient relative humidity	0.001192	0.00087	0.1697
MC-21	Intercept	0.829125	0.80015	0.3012
	Milk Production	0.031273	0.02257	0.1674
	Ambient temperature	0.019256	0.00208	<.0001

Model	Parameter	Estimate	Standard Error	p-value
MC-22	Intercept	1.548428	0.80445	0.056
	Milk Production	0.015087	0.02273	0.5079
	Ambient relative humidity	0.000923	0.00099	0.3531
MC-23	Intercept	1.120794	0.94412	0.2367
	Milk Production	0.022857	0.02672	0.3935
	Exhaust relative humidity	0.000694	0.00152	0.6489
	Ambient temperature	0.015329	0.00252	<.0001
MC-24	Intercept	0.774798	0.79271	0.3292
	Milk Production	0.025147	0.02248	0.2642
	Exhaust temperature	0.032583	0.00296	<.0001
	Ambient relative humidity	0.001034	0.00083	0.2133
MC-25	Intercept	1.397358	0.17941	<.0001
	Exhaust temperature	0.068193	0.00507	<.0001
	Exhaust relative humidity	0.009331	0.00191	<.0001
MC-26	Intercept	2.077434	0.11748	<.0001
	Exhaust temperature	0.072495	0.00453	<.0001
MC-27	Intercept	2.153227	0.18617	<.0001
	Exhaust relative humidity	0.012156	0.00217	<.0001
MC-28	Intercept	2.12093	0.14039	<.0001
	Ambient temperature	0.047334	0.00332	<.0001
	Ambient relative humidity	0.00551	0.00139	<.0001
MC-29	Intercept	2.505637	0.10119	<.0001
	Ambient temperature	0.046434	0.00335	<.0001
MC-30	Intercept	2.774069	0.14027	<.0001
	Ambient relative humidity	0.004302	0.00159	0.0069
MC-31	Intercept	1.700751	0.17521	<.0001
	Exhaust relative humidity	0.010613	0.00199	<.0001
	Ambient temperature	0.043973	0.00371	<.0001
MC-32	Intercept	1.78757	0.14904	<.0001
	Exhaust temperature	0.074156	0.00458	<.0001
	Ambient relative humidity	0.003945	0.00134	0.0032

Table G-14. Fit and evaluation statistics for NH₃ emission models for dairy milking centers.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (kg day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
MC-1	-266	-256	-256	-238	0.209	8.607	27.94	1.684	0.139	2.31
MC-2	-366	-358	-358	-342	0.318	9.035	30.29	1.759	0.224	3.861
MC-3	-224	-216	-216	-201	-0.024	8.906	28.11	1.695	0.004	0.062
MC-4	-335	-325	-325	-306	0.316	9.015	29.85	1.729	0.201	3.471
MC-5	-333	-325	-325	-310	0.316	8.912	29.47	1.707	0.188	3.24
MC-6	-261	-253	-253	-238	-0.127	9.095	29.09	1.685	0.007	0.118
MC-7	-243	-233	-233	-215	0.208	8.636	27.84	1.675	0.125	2.077
MC-8	-356	-346	-346	-327	0.315	9.509	32.04	1.855	0.267	4.609
MC-9	16	28	29	31	0.614	15.49	47.52	3.521	0.086	1.159
MC-10	-24	-14	-14	-12	0.558	15.93	49.43	3.55	0.226	3.147
MC-11	187	197	197	199	0.412	17.2	52.4	3.883	-0.157	-2.112
MC-12	14	26	26	28	0.537	16.38	50.44	3.619	0.21	2.926
MC-13	30	40	40	42	0.541	16.16	49.76	3.57	0.168	2.34
MC-14	202	212	212	214	0.104	17.21	53.21	3.818	-0.045	-0.62
MC-15	55	67	67	69	0.607	15.66	47.7	3.532	0.034	0.46
MC-16	-29	-17	-17	-14	0.557	16.16	50.06	3.592	0.266	3.709
MC-17	-266	-254	-254	-232	0.209	8.607	27.94	1.684	0.139	2.31
MC-18	-366	-356	-356	-337	0.318	9.035	30.29	1.759	0.224	3.861
MC-19	-224	-214	-214	-196	-0.024	8.906	28.11	1.695	0.004	0.062
MC-20	-335	-323	-323	-300	0.316	9.015	29.85	1.729	0.201	3.471
MC-21	-333	-323	-323	-304	0.316	8.912	29.47	1.707	0.188	3.24
MC-22	-261	-251	-251	-232	-0.127	9.095	29.09	1.685	0.007	0.118
MC-23	-243	-231	-231	-210	0.208	8.636	27.84	1.675	0.125	2.077
MC-24	-356	-344	-344	-321	0.315	9.509	32.04	1.855	0.267	4.609
MC-25	382	392	392	394	0.514	17.68	52.09	12.03	2.2	9.522
MC-26	390	398	398	400	0.384	18.81	58.25	13.66	3.717	15.85
MC-27	541	549	550	551	0.373	19.48	49.75	11.49	-0.169	-0.732
MC-28	423	433	433	435	0.401	18.31	55.01	12.82	3.194	13.7
MC-29	438	446	446	448	0.394	18.25	54.18	12.63	3.017	12.94
MC-30	601	609	609	611	0.079	18.92	48.9	11.4	0.006	0.025
MC-31	412	422	423	424	0.529	17.31	49.26	11.29	1.719	7.5
MC-32	381	391	391	393	0.386	19.1	60.13	14.02	3.985	17.1

^a Based on transformed data (i.e., ln(NH₃)).

^b Based on back-transformed data.

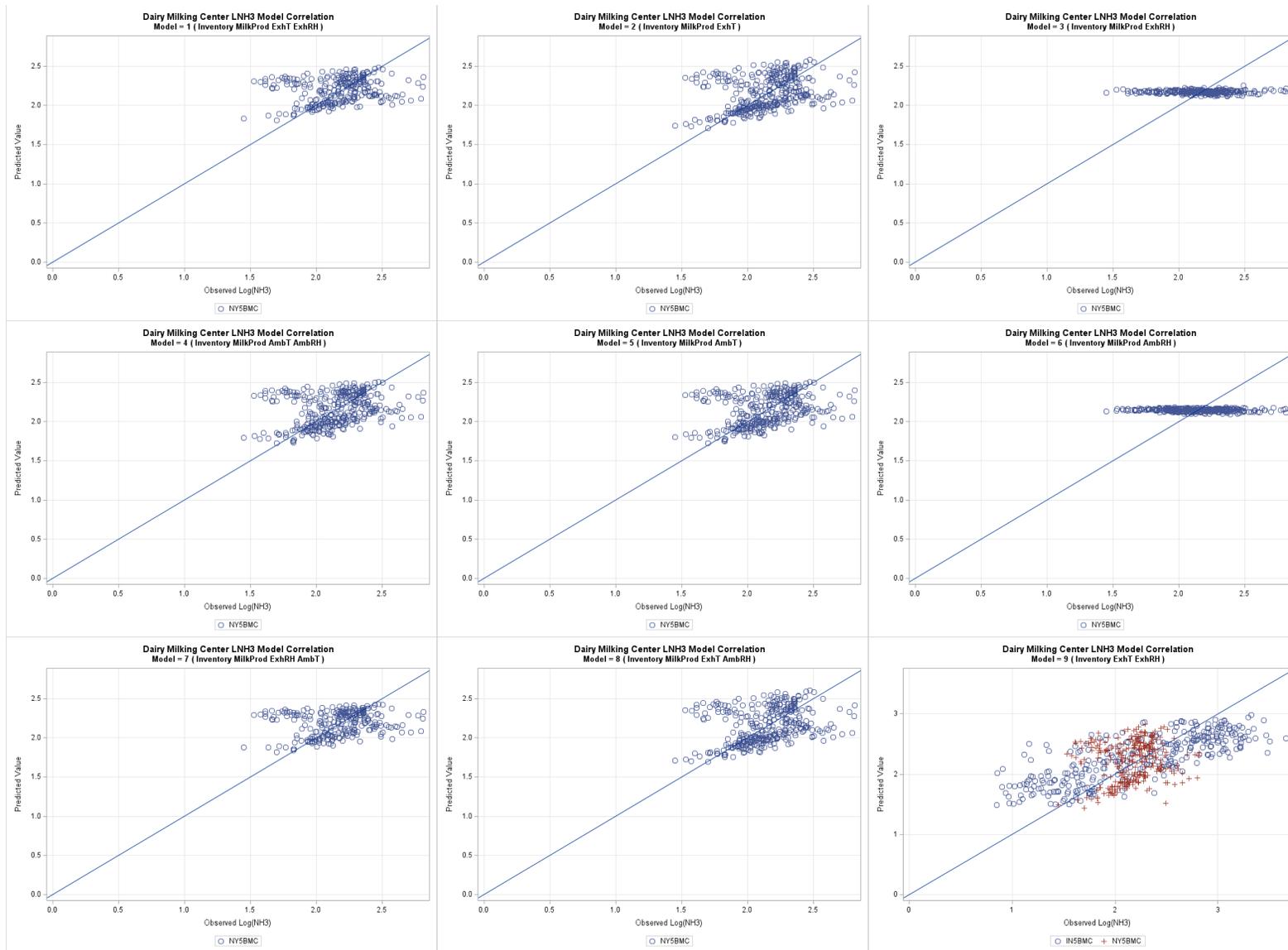


Figure G-17. Dairy milking center NH₃ one-to-one plots models 1 through 9, log transformed.

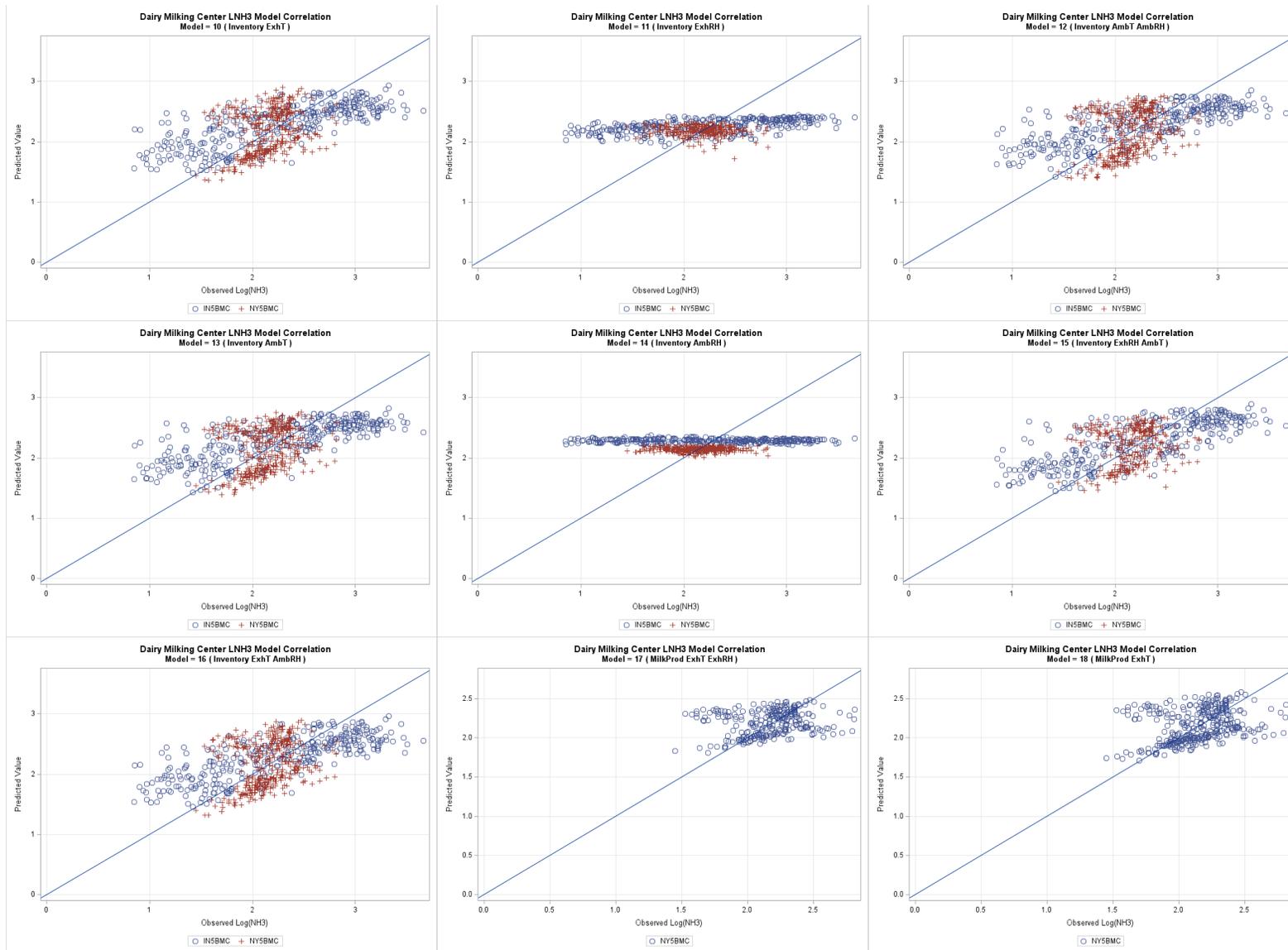


Figure G-18. Dairy milking center NH₃ one-to-one plots models 10 through 18, log transformed.

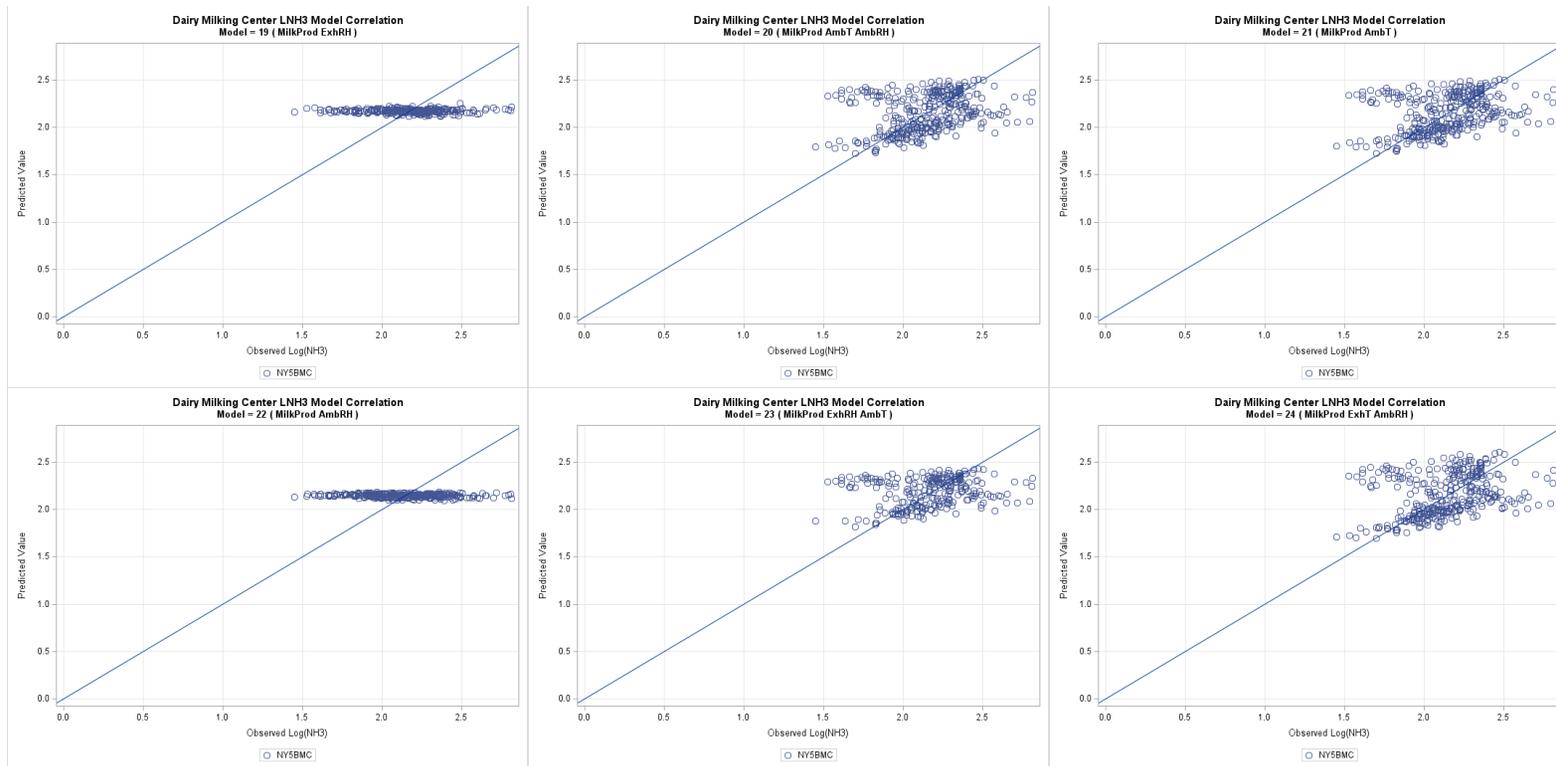


Figure G-19. Dairy milking center NH₃ one-to-one plots models 19 through 24, log transformed.

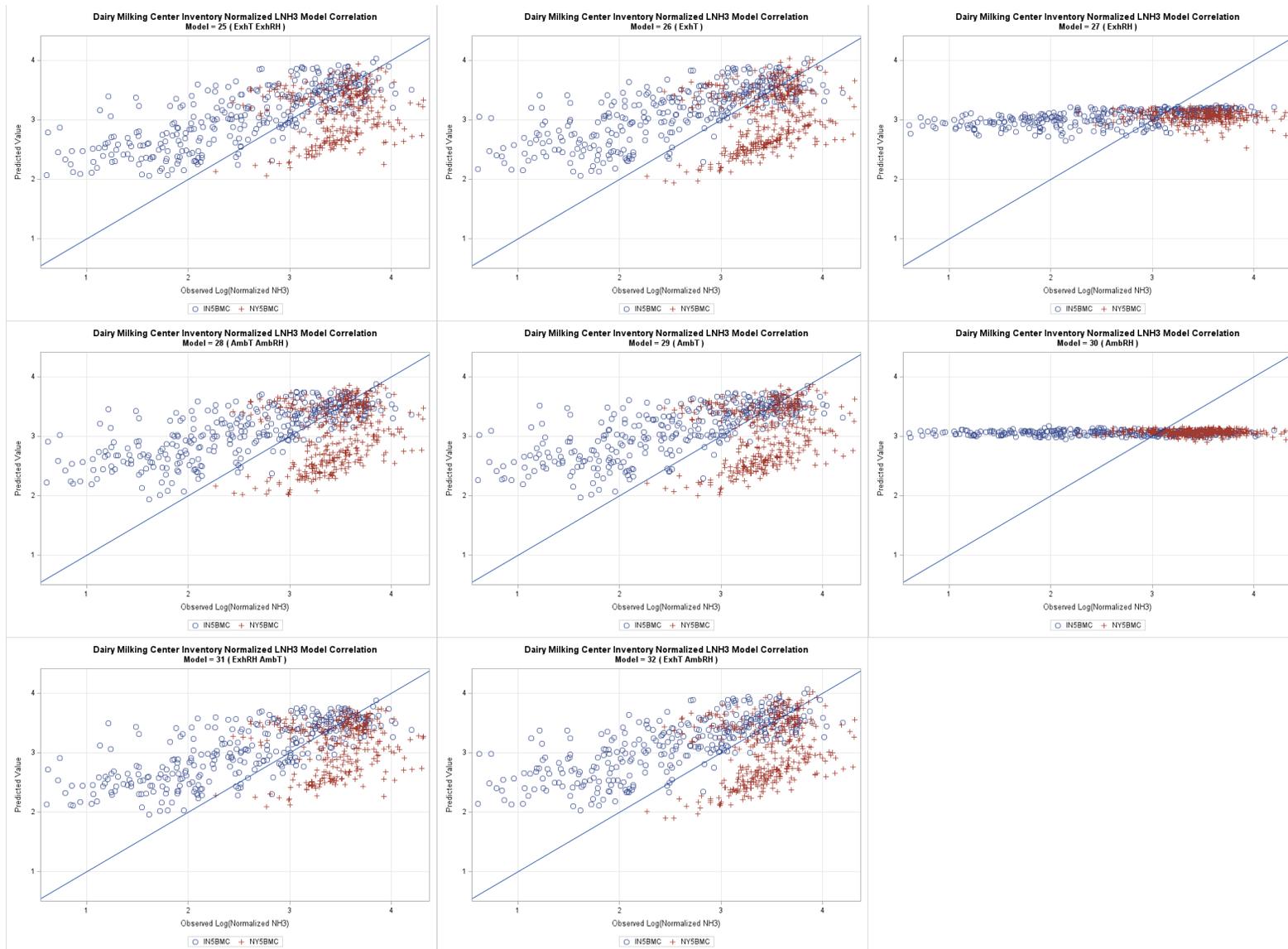


Figure G-20. Dairy milking center NH₃ one-to-one plots models 25 through 32, log transformed.

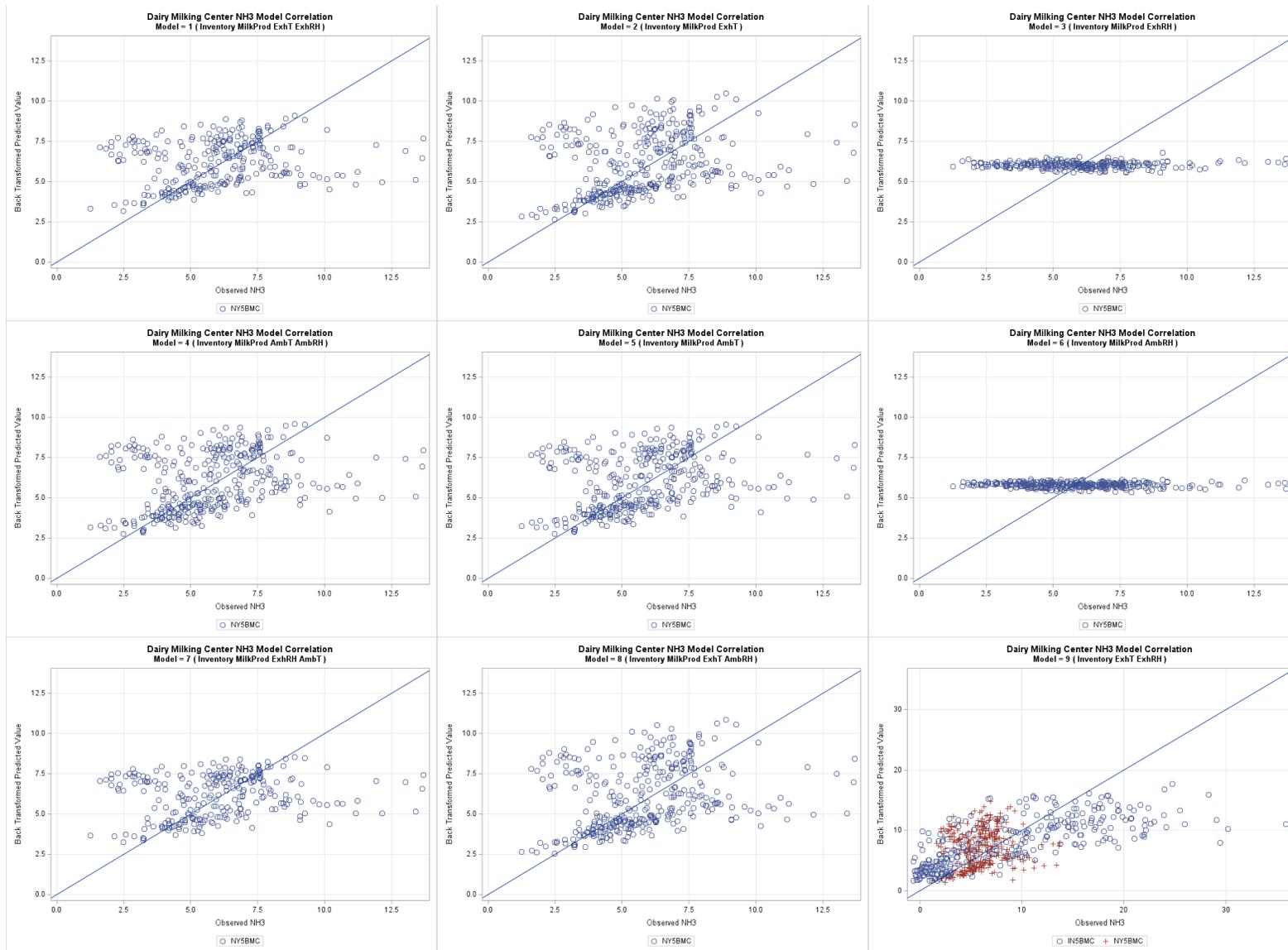


Figure G-21 Dairy milking center NH₃ one-to-one plots models 1 through 9, back transformed.

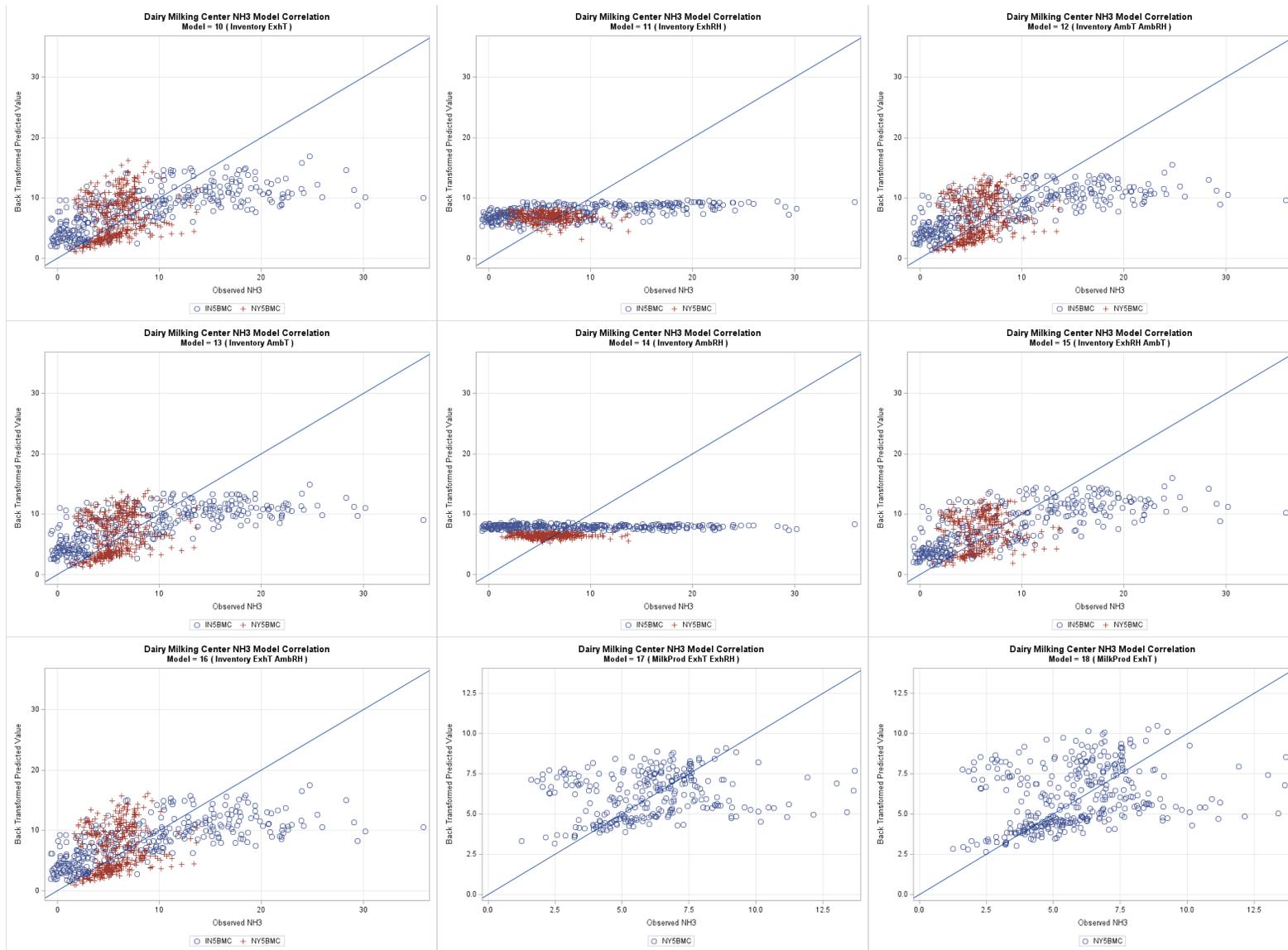


Figure G-22 Dairy milking center NH₃ one-to-one plots models 10 through 18, back transformed.

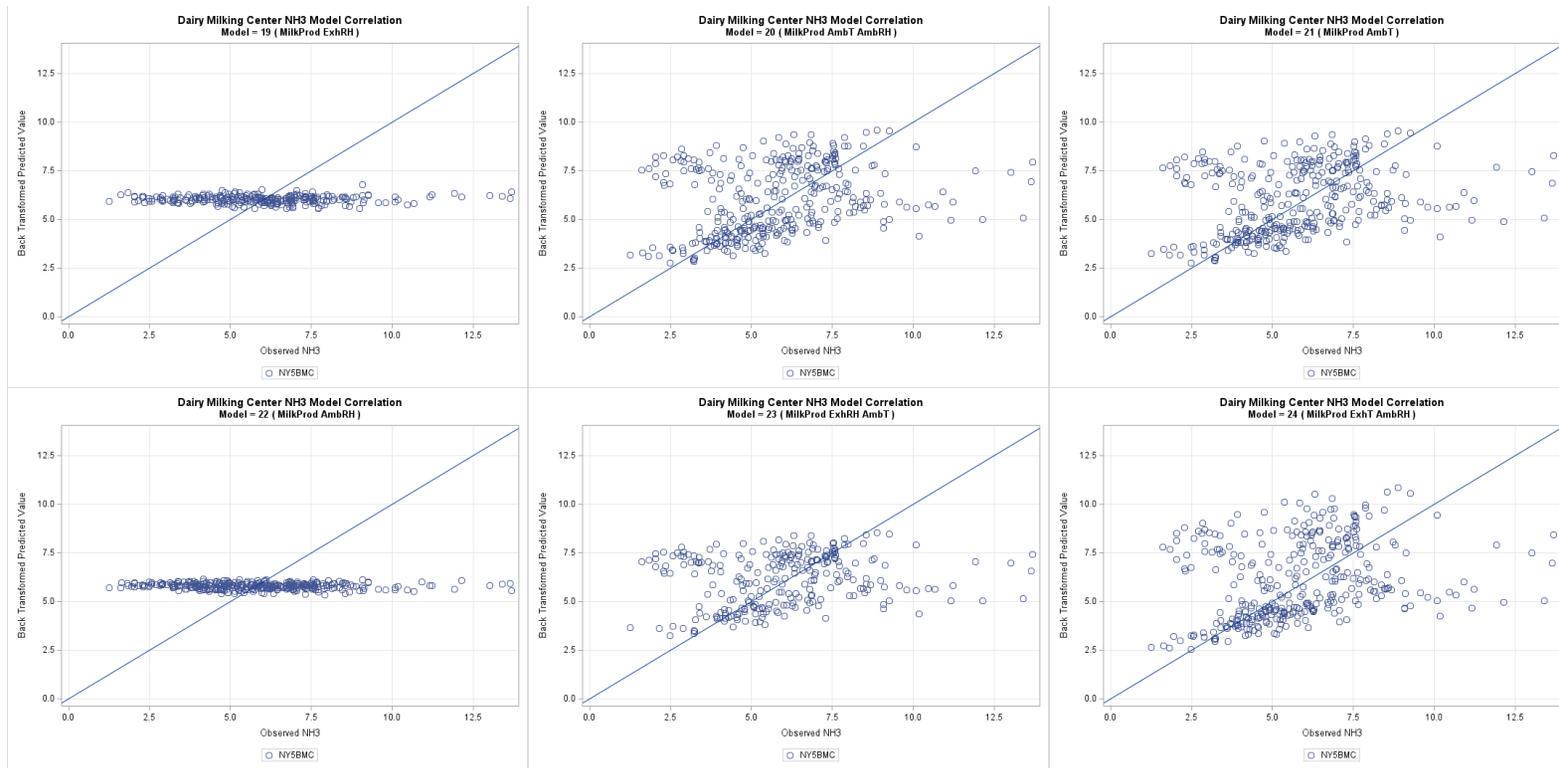


Figure G-23 Dairy milking center NH₃ one-to-one plots models 19 through 24, back transformed.

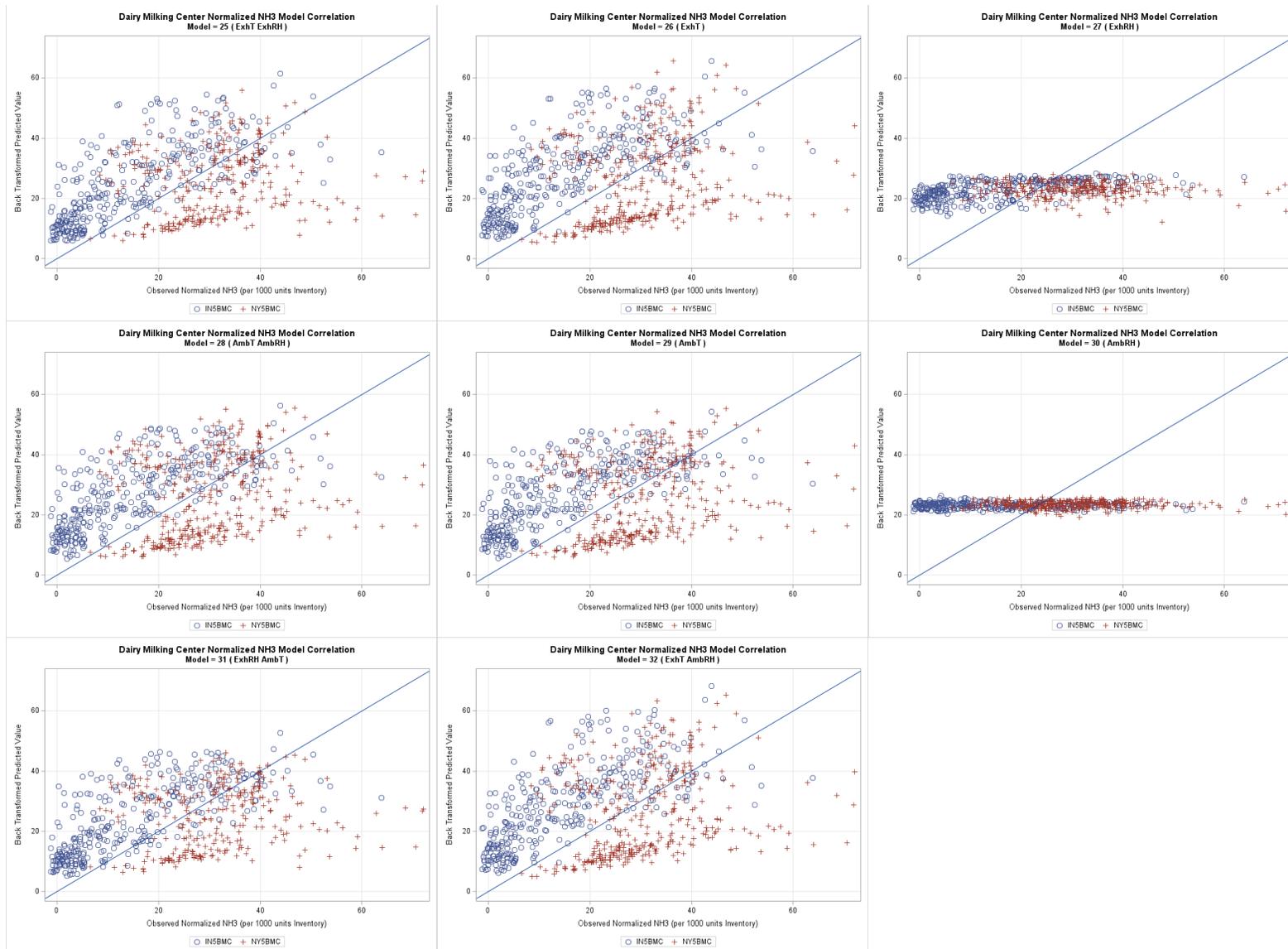


Figure G-24 Dairy milking center NH₃ one-to-one plots models 25 through 32, back transformed.

G.2.2 Hydrogen Sulfide (H₂S)

Table G-15. Parameter and estimates H₂S emission models for dairy milking centers.

Model	Parameter	Estimate	Standard Error	p-value
MC-1	Intercept	7.893109	0.43963	<.0001
	Inventory	0	.	.
	Milk Production	-0.035798	0.01243	0.0043
	Exhaust temperature	-0.000485	0.00156	0.7567
	Exhaust relative humidity	0.000179	0.00066	0.7859
MC-2	Intercept	7.717017	0.35514	<.0001
	Inventory	0	.	.
	Milk Production	-0.032225	0.00999	0.0014
	Exhaust temperature	0.003142	0.00125	<i>0.0128</i>
MC-3	Intercept	7.898421	0.43608	<.0001
	Inventory	0	.	.
	Milk Production	-0.036205	0.01229	0.0035
	Exhaust relative humidity	0.000204	0.00065	0.7547
MC-4	Intercept	7.531657	0.35782	<.0001
	Inventory	0	.	.
	Milk Production	-0.028082	0.01007	0.0057
	Ambient temperature	0.002876	0.00088	0.0013
	Ambient relative humidity	0.000661	0.00042	0.115
MC-5	Intercept	7.543277	0.36085	<.0001
	Inventory	0	.	.
	Milk Production	-0.02709	0.01015	0.0082
	Ambient temperature	0.002689	0.00089	0.0029
MC-6	Intercept	7.501342	0.37715	<.0001
	Inventory	0	.	.
	Milk Production	-0.025945	0.01065	<i>0.0154</i>
	Ambient relative humidity	0.000501	0.00041	0.2271
MC-7	Intercept	7.66922	0.45352	<.0001
	Inventory	0	.	.
	Milk Production	-0.029811	0.01283	<i>0.021</i>
	Exhaust relative humidity	0.000297	0.00067	0.6574
	Ambient temperature	-0.000295	0.00117	0.8018
MC-8	Intercept	7.522973	0.36263	<.0001
	Inventory	0	.	.
	Milk Production	-0.028004	0.0102	0.0065
	Exhaust temperature	0.003377	0.00126	0.008
	Ambient relative humidity	0.000596	0.00042	0.1536
MC-9	Intercept	5.509849	0.16201	<.0001
	Inventory	1.31127	0.18731	<.0001
	Exhaust temperature	0.024987	0.00417	<.0001
	Exhaust relative humidity	0.006798	0.00191	0.0004
MC-10	Intercept	6.049	0.09117	<.0001
	Inventory	1.355319	0.19579	<.0001
	Exhaust temperature	0.022625	0.0038	<.0001
MC-11	Intercept	5.942188	0.16899	<.0001
	Inventory	1.351143	0.23652	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Exhaust relative humidity	0.00596	0.00194	0.0022
MC-12	Intercept	6.034746	0.12697	<.0001
	Inventory	1.40603	0.1962	<.0001
	Ambient temperature	0.016109	0.00273	<.0001
	Ambient relative humidity	0.001621	0.00136	0.2333
MC-13	Intercept	6.149091	0.08507	<.0001
	Inventory	1.405751	0.19795	<.0001
	Ambient temperature	0.015731	0.00274	<.0001
MC-14	Intercept	6.281146	0.13305	<.0001
	Inventory	1.493207	0.24053	<.0001
	Ambient relative humidity	0.000723	0.00135	0.5928
MC-15	Intercept	5.570392	0.16012	<.0001
	Inventory	1.359386	0.18838	<.0001
	Exhaust relative humidity	0.007425	0.00193	0.0001
	Ambient temperature	0.017816	0.00297	<.0001
MC-16	Intercept	5.971123	0.13014	<.0001
	Inventory	1.358924	0.1965	<.0001
	Exhaust temperature	0.023044	0.00384	<.0001
	Ambient relative humidity	0.001053	0.00135	0.4366
MC-17	Intercept	7.893109	0.43963	<.0001
	Milk Production	-0.035798	0.01243	0.0043
	Exhaust temperature	-0.000485	0.00156	0.7567
	Exhaust relative humidity	0.000179	0.00066	0.7859
MC-18	Intercept	7.717017	0.35514	<.0001
	Milk Production	-0.032225	0.00999	0.0014
	Exhaust temperature	0.003142	0.00125	<i>0.0128</i>
MC-19	Intercept	7.898421	0.43608	<.0001
	Milk Production	-0.036205	0.01229	0.0035
	Exhaust relative humidity	0.000204	0.00065	0.7547
MC-20	Intercept	7.531657	0.35782	<.0001
	Milk Production	-0.028082	0.01007	0.0057
	Ambient temperature	0.002876	0.00088	0.0013
	Ambient relative humidity	0.000661	0.00042	0.115
MC-21	Intercept	7.543277	0.36085	<.0001
	Milk Production	-0.02709	0.01015	0.0082
	Ambient temperature	0.002689	0.00089	0.0029
MC-22	Intercept	7.501342	0.37715	<.0001
	Milk Production	-0.025945	0.01065	<i>0.0154</i>
	Ambient relative humidity	0.000501	0.00041	0.2271
MC-23	Intercept	7.66922	0.45352	<.0001
	Milk Production	-0.029811	0.01283	<i>0.021</i>
	Exhaust relative humidity	0.000297	0.00067	0.6574
	Ambient temperature	-0.000295	0.00117	0.8018
MC-24	Intercept	7.522973	0.36263	<.0001
	Milk Production	-0.028004	0.0102	0.0065
	Exhaust temperature	0.003377	0.00126	0.008
	Ambient relative humidity	0.000596	0.00042	0.1536
MC-25	Intercept	6.121627	0.19903	<.0001
	Exhaust temperature	0.0332	0.00556	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Exhaust relative humidity	0.008349	0.00245	0.0007
MC-26	Intercept	6.727295	0.08868	<.0001
	Exhaust temperature	0.033995	0.00499	<.0001
MC-27	Intercept	6.719077	0.19516	<.0001
	Exhaust relative humidity	0.007161	0.00248	0.004
MC28	Intercept	6.712936	0.14037	<.0001
	Ambient temperature	0.024797	0.00361	<.0001
	Ambient relative humidity	0.002601	0.00174	0.1357
MC-29	Intercept	6.898188	0.07052	<.0001
	Ambient temperature	0.024053	0.00361	<.0001
MC-30	Intercept	7.141095	0.13417	<.0001
	Ambient relative humidity	0.001169	0.00173	0.4985
MC-31	Intercept	6.21485	0.19461	<.0001
	Exhaust relative humidity	0.009244	0.00247	0.0002
	Ambient temperature	0.02404	0.00398	<.0001
MC-32	Intercept	6.596762	0.14782	<.0001
	Exhaust temperature	0.034941	0.00504	<.0001
	Ambient relative humidity	0.001726	0.00173	0.3196

Table G-16. Fit and evaluation statistics for H₂S emission models for dairy milking centers.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
MC-1	-836	-826	-826	-806	0.237	1.655	62.34	88.63	-0.125	-0.088
MC-2	-1077	-1069	-1069	-1052	0.487	1.458	59.63	77.93	-0.889	-0.681
MC-3	-836	-828	-828	-812	0.279	1.639	61.71	87.73	-0.247	-0.174
MC-4	-1062	-1052	-1051	-1030	0.532	1.402	58.25	75.04	-1.048	-0.813
MC-5	-1059	-1051	-1051	-1034	0.518	1.425	59.07	76.1	-1.01	-0.784
MC-6	-1057	-1049	-1049	-1032	0.344	1.557	64.53	83.19	-0.449	-0.348
MC-7	-816	-806	-806	-786	0.205	1.663	63.38	88.8	-0.123	-0.088
MC-8	-1062	-1052	-1052	-1031	0.504	1.438	59.67	76.92	-0.952	-0.739
MC-9	671	683	683	685	0.648	4.686	90.64	589.1	-100.4	-15.44
MC-10	667	677	677	679	0.598	4.648	94.71	563	-82.11	-13.81
MC-11	698	708	708	710	0.512	5.28	101.5	659.4	-76.1	-11.71
MC-12	669	681	681	683	0.6	4.707	94.81	567.1	-82.69	-13.82
MC-13	670	680	680	682	0.596	4.721	95.1	568.9	-81.9	-13.69
MC-14	696	706	706	708	0.464	5.108	105.1	628.3	-59.23	-9.91
MC-15	670	682	683	685	0.651	4.725	90.48	592.8	-101.3	-15.47
MC-16	668	680	680	682	0.6	4.671	94.87	567.1	-83.35	-13.94
MC-17	-836	-824	-824	-800	0.237	1.655	62.34	88.63	-0.125	-0.088
MC-18	-1077	-1067	-1067	-1046	0.487	1.458	59.63	77.93	-0.889	-0.681
MC-19	-836	-826	-826	-806	0.279	1.639	61.71	87.73	-0.247	-0.174
MC-20	-1062	-1050	-1049	-1024	0.532	1.402	58.25	75.04	-1.048	-0.813
MC-21	-1059	-1049	-1049	-1028	0.518	1.425	59.07	76.1	-1.01	-0.784
MC-22	-1057	-1047	-1047	-1026	0.344	1.557	64.53	83.19	-0.449	-0.348
MC-23	-816	-804	-804	-780	0.205	1.663	63.38	88.8	-0.123	-0.088
MC-24	-1062	-1050	-1050	-1025	0.504	1.438	59.67	76.92	-0.952	-0.739
MC-25	1080	1090	1090	1092	0.613	6.679	87.05	1235	-153.9	-10.84
MC-26	1147	1155	1155	1156	0.547	6.632	89.96	1190	-118.3	-8.949
MC-27	1105	1113	1113	1115	0.454	7.858	99.39	1410	-54.77	-3.86
MC-28	1139	1149	1149	1151	0.551	6.556	90.52	1198	-116.2	-8.777
MC-29	1141	1149	1149	1150	0.542	6.611	90.97	1204	-113.5	-8.571
MC-30	1173	1181	1181	1183	0.099	7.907	105.2	1392	-1.373	-0.104
MC-31	1071	1081	1081	1083	0.614	6.634	87.47	1244	-154.3	-10.85
MC-32	1138	1148	1148	1150	0.554	6.612	90.08	1192	-122.5	-9.259

^a Based on transformed data (i.e., ln(H₂S)).

^b Based on back-transformed data.

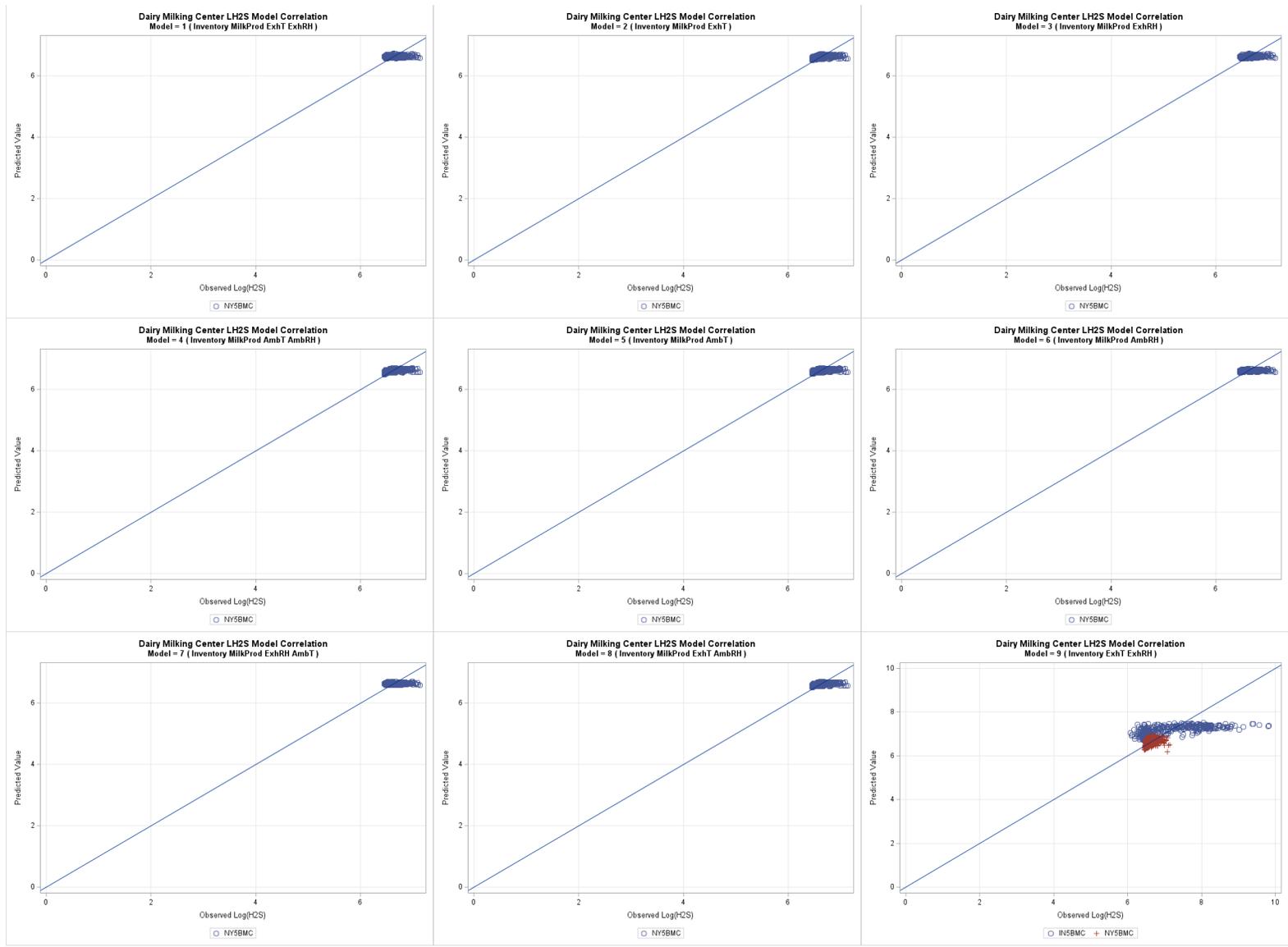


Figure G-25. Dairy milking center H₂S one-to-one plots models 1 through 9, log transformed.

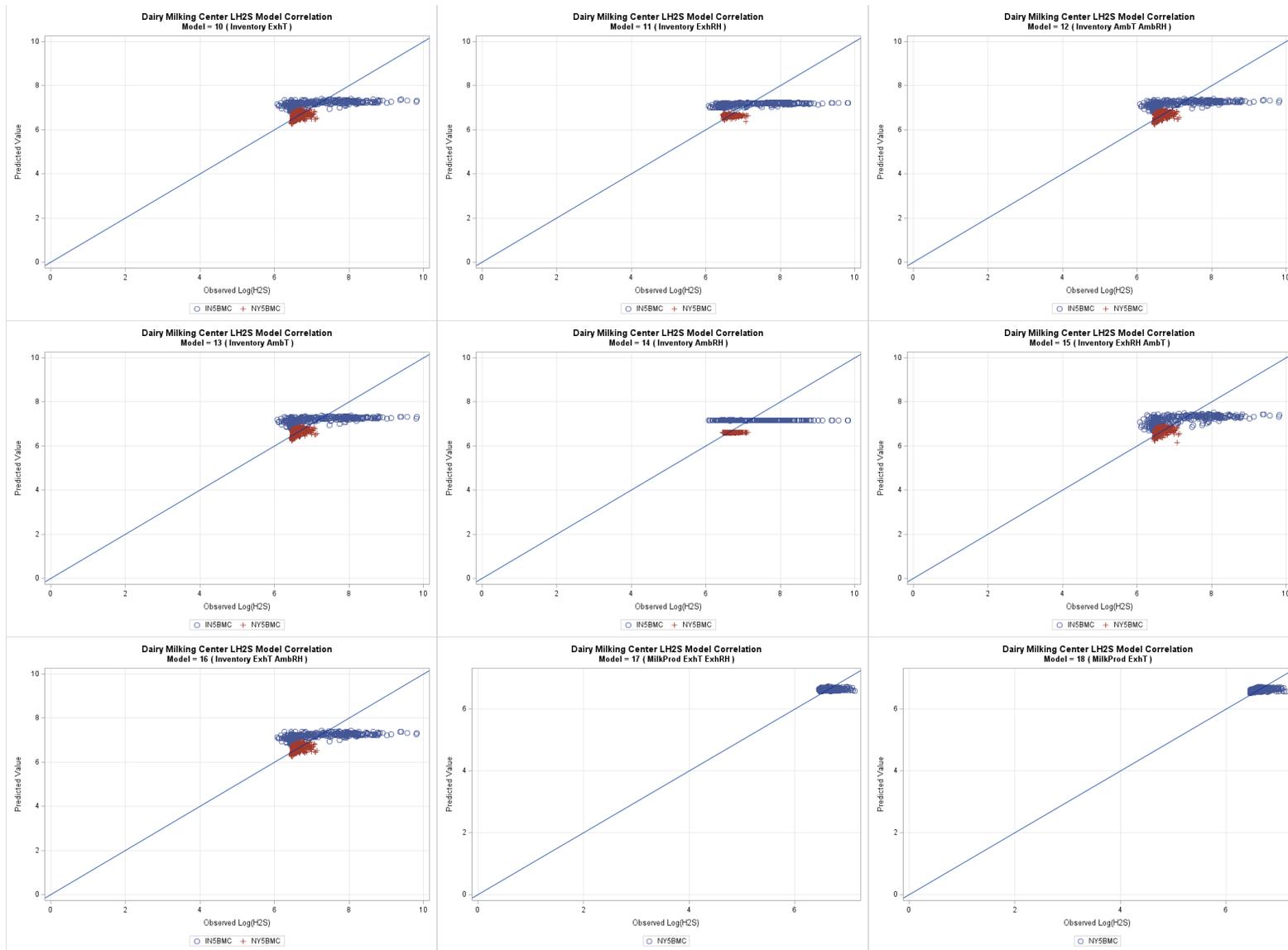


Figure G-26. Dairy milking center H₂S one-to-one plots models 10 through 18, log transformed.

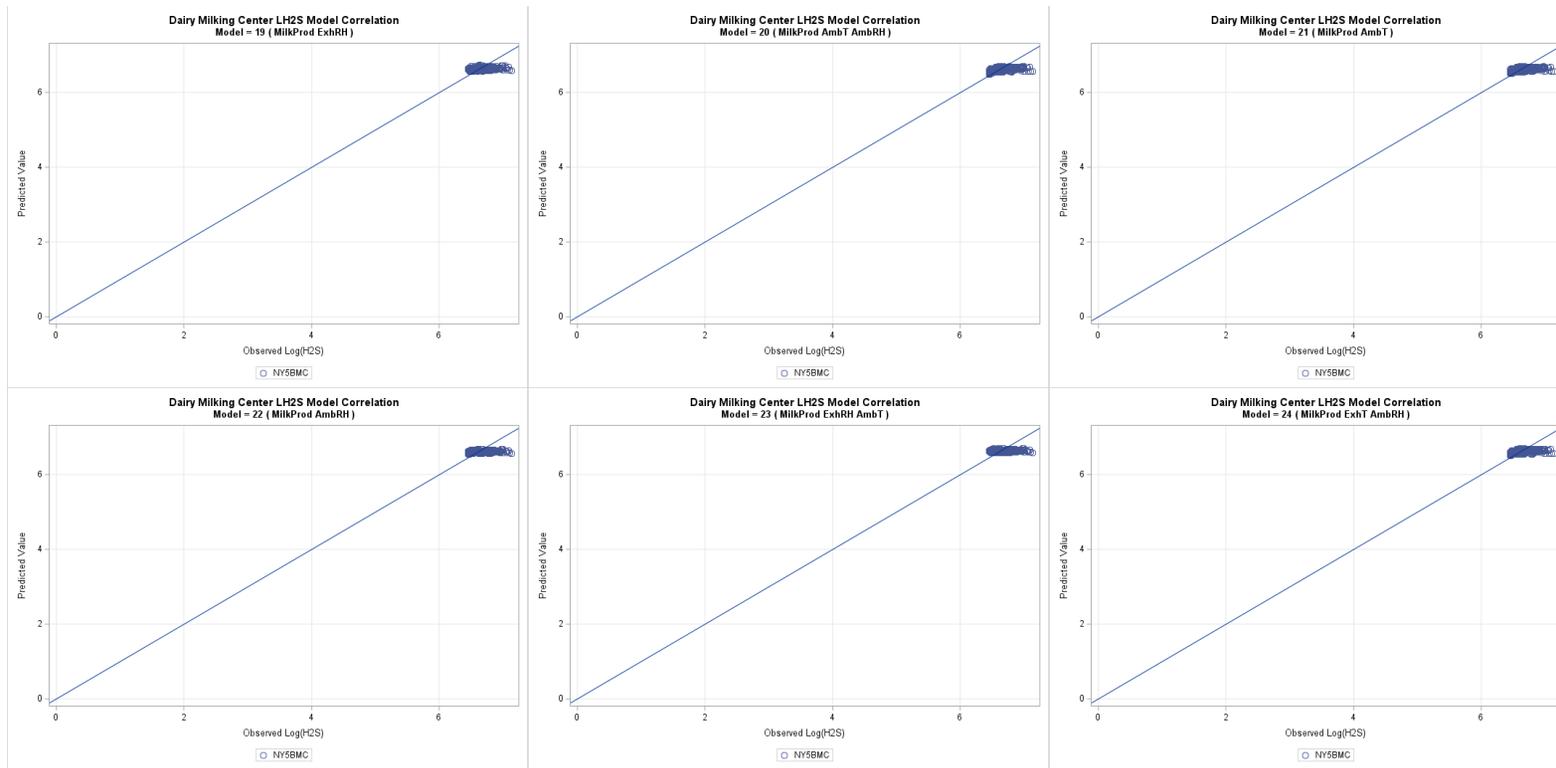


Figure G-27. Dairy milking center H₂S one-to-one plots models 19 through 24, log transformed.

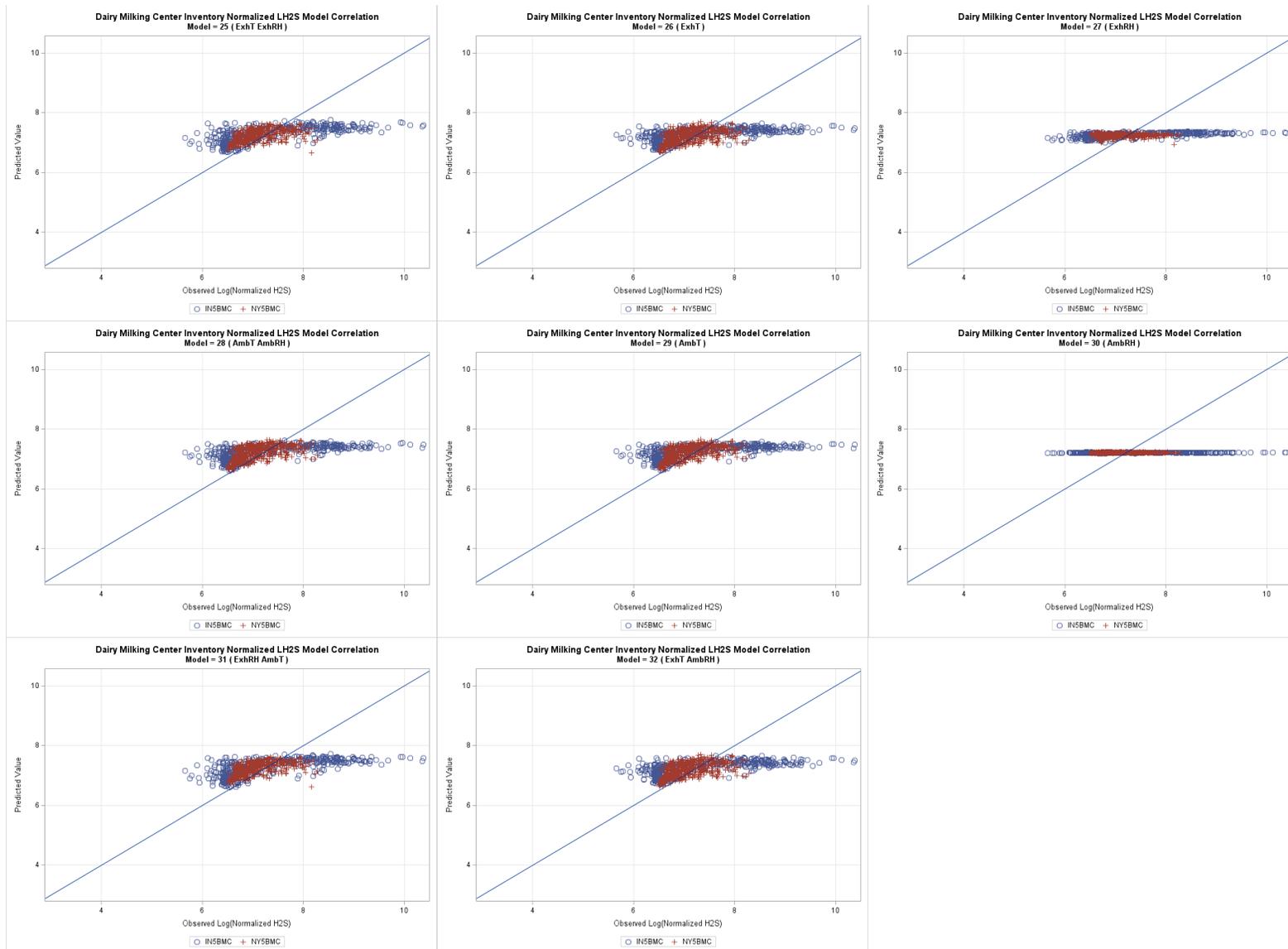


Figure G-28. Dairy milking center H₂S one-to-one plots models 25 through 32, log transformed.

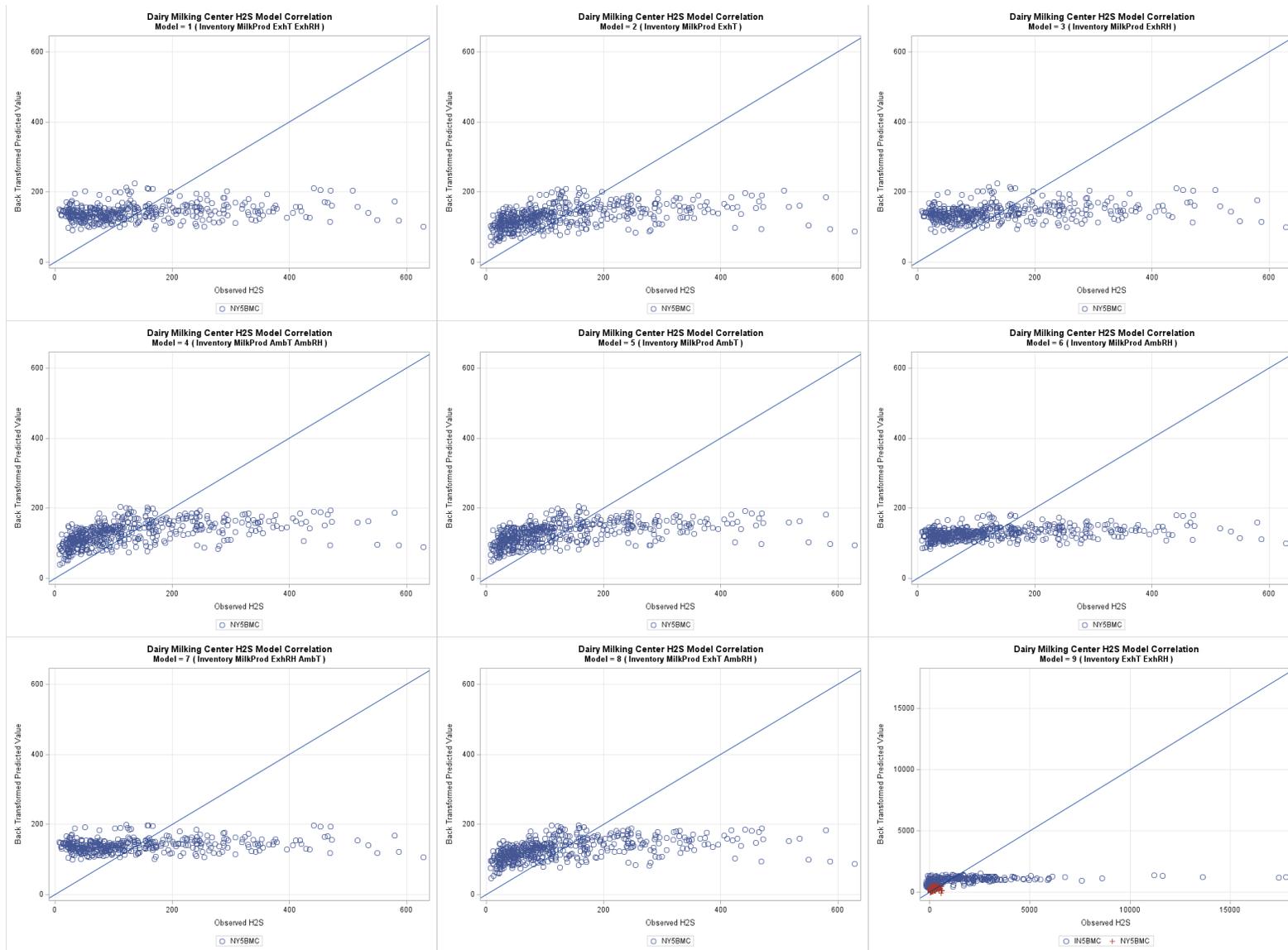


Figure G-29. Dairy milking center H₂S one-to-one plots models 1 through 9, back transformed.

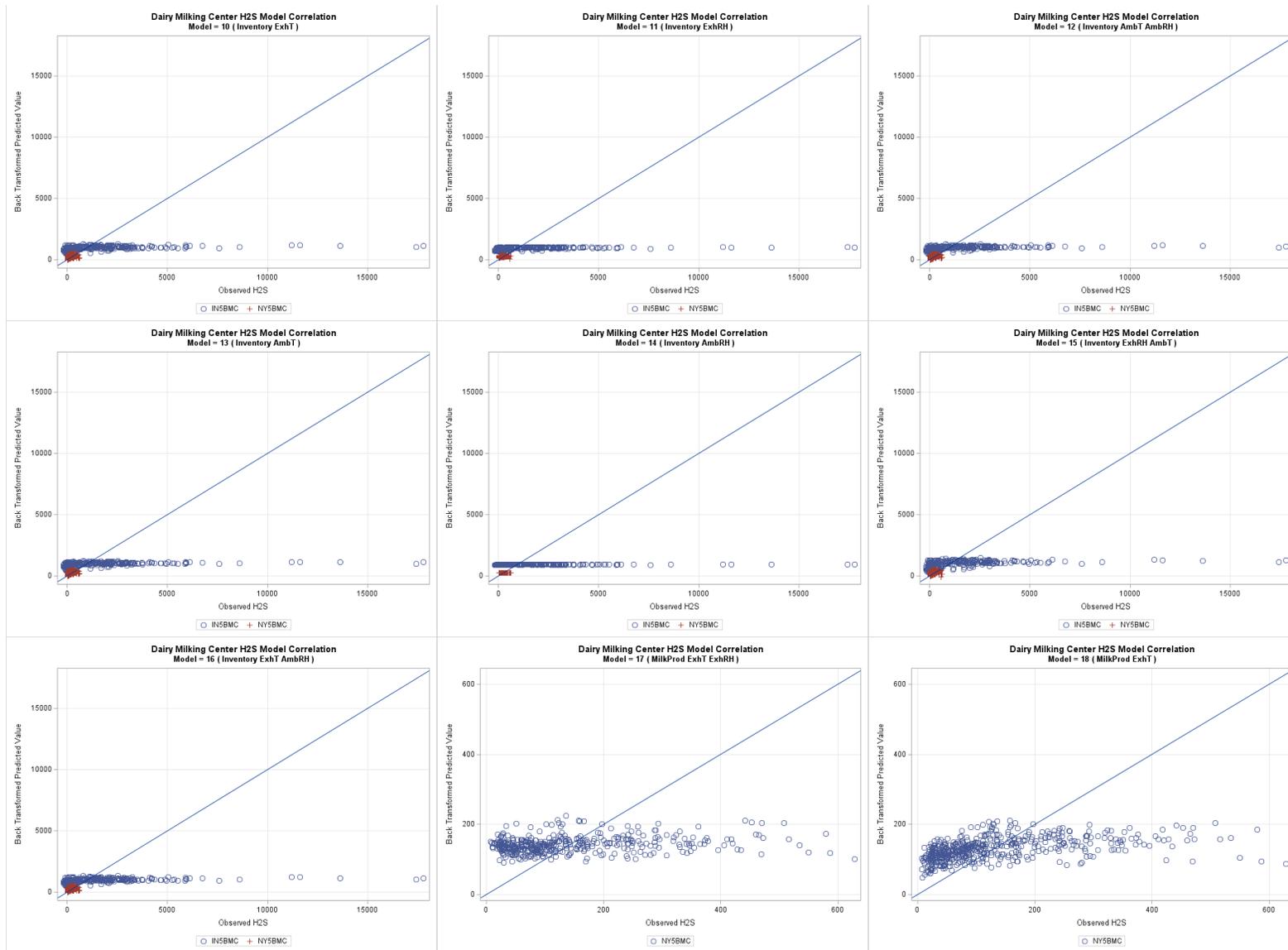


Figure G-30. Dairy milking center H₂S one-to-one plots models 10 through 18, back transformed.

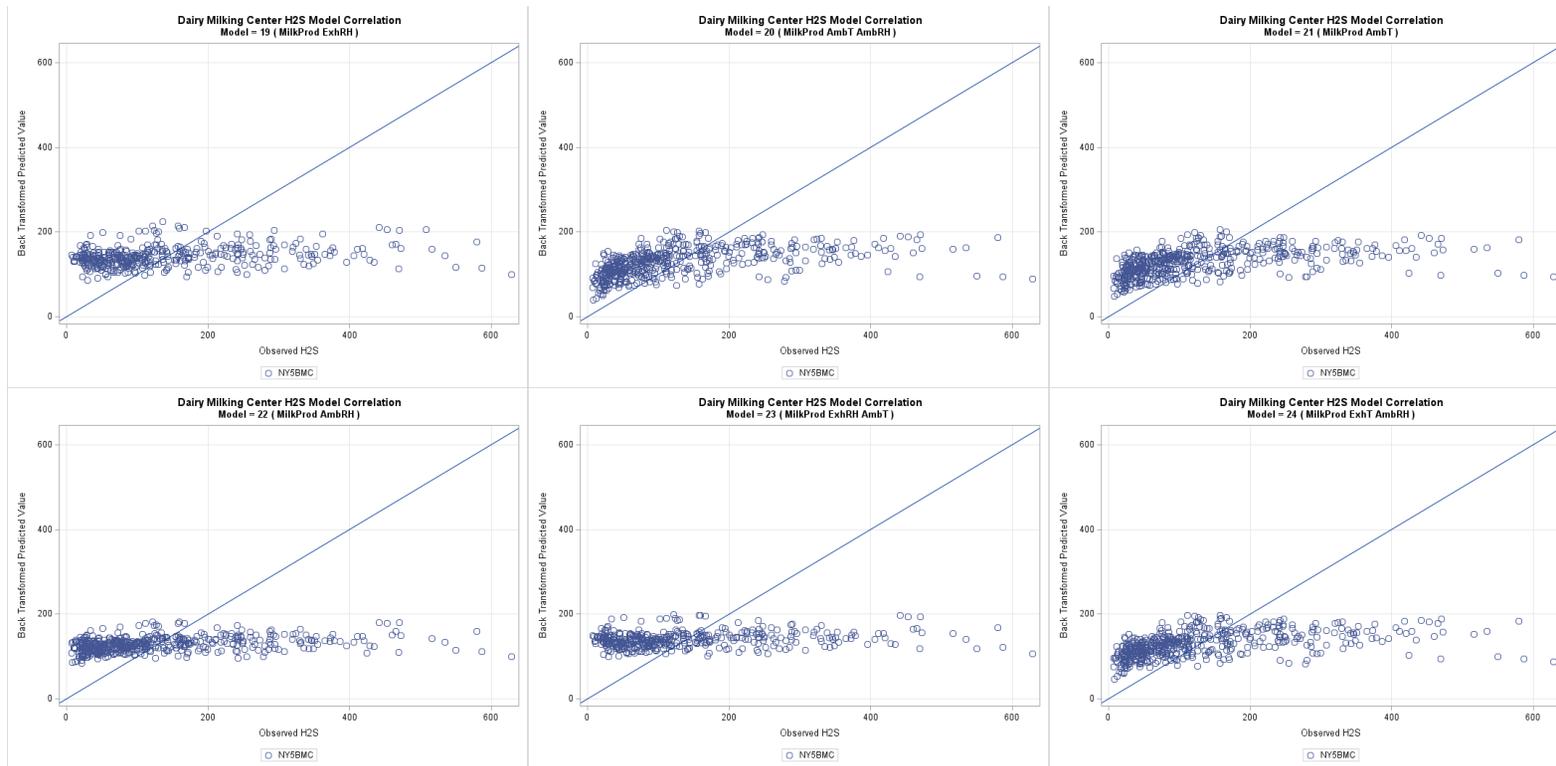


Figure G-31. Dairy milking center H₂S one-to-one plots models 19 through 24, back transformed.

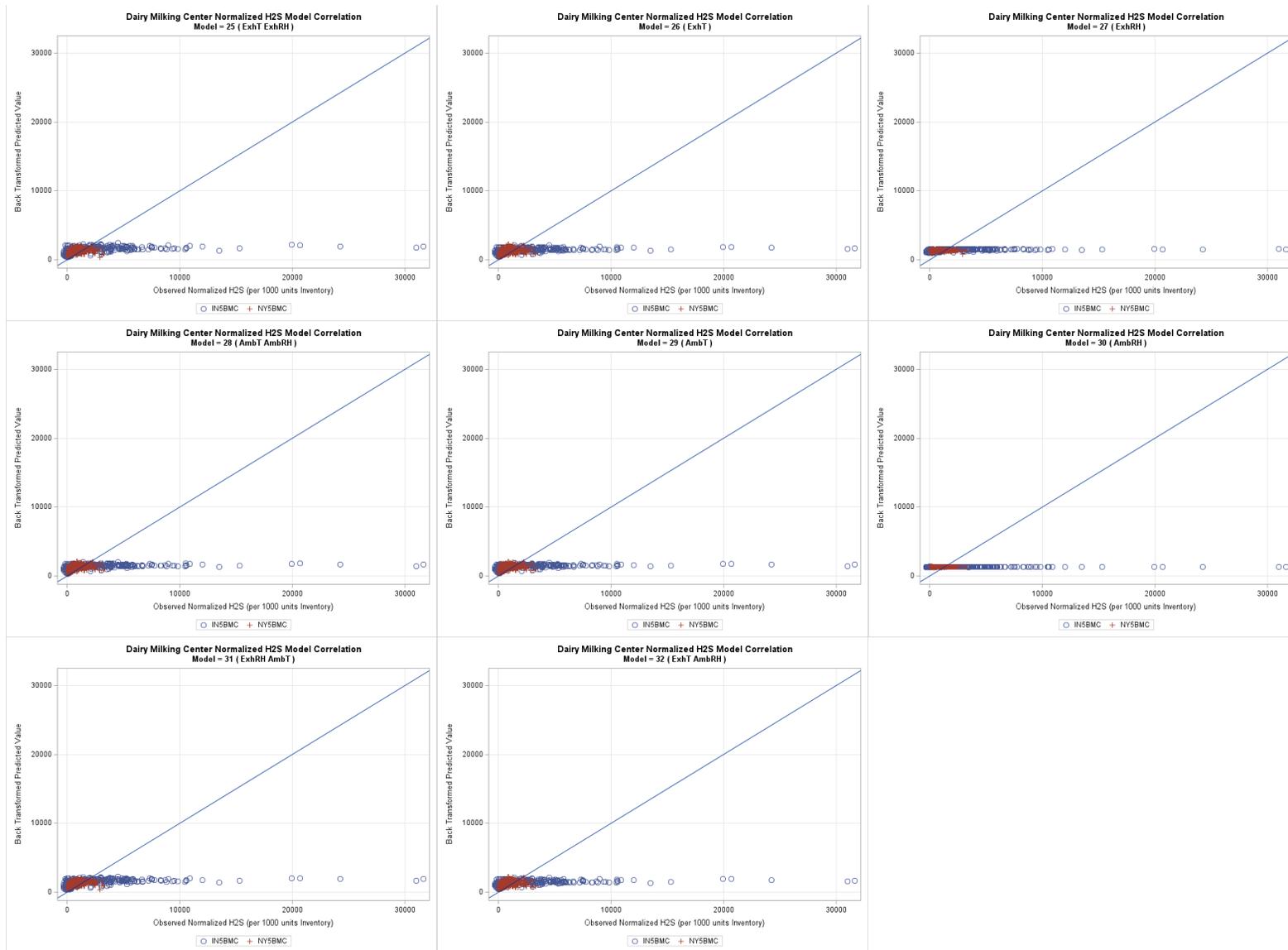


Figure G-32. Dairy milking center H₂S one-to-one plots models 25 through 32, back transformed.

G.2.3 PM₁₀

Table G-17. Parameter and estimates PM₁₀ emission models for dairy milking centers.

Model	Parameter	Estimate	Standard Error	p-value
MC-1	Intercept	7.910105	0.09756	<.0001
	Inventory	0	.	.
	Milk Production	-0.003003	0.00272	0.2724
	Exhaust temperature	0.00227	0.00035	<.0001
	Exhaust relative humidity	-0.001367	0.00018	<.0001
MC-2	Intercept	7.818453	0.08025	<.0001
	Inventory	0	.	.
	Milk Production	-0.0032	0.00224	0.156
	Exhaust temperature	0.002308	0.0003	<.0001
MC-3	Intercept	7.939436	0.11836	<.0001
	Inventory	0	.	.
	Milk Production	-0.002741	0.00333	0.4125
	Exhaust relative humidity	-0.001433	0.00019	<.0001
MC-4	Intercept	7.905604	0.07678	<.0001
	Inventory	0	.	.
	Milk Production	-0.003753	0.00215	0.0824
	Ambient temperature	0.001506	0.00019	<.0001
	Ambient relative humidity	-0.000804	0.00011	<.0001
MC-5	Intercept	7.839738	0.08147	<.0001
	Inventory	0	.	.
	Milk Production	-0.003497	0.00228	0.1277
	Ambient temperature	0.001685	0.00021	<.0001
MC-6	Intercept	8.009566	0.09414	<.0001
	Inventory	0	.	.
	Milk Production	-0.006083	0.00266	<i>0.0236</i>
	Ambient relative humidity	-0.000848	0.00011	<.0001
MC-7	Intercept	7.930999	0.10033	<.0001
	Inventory	0	.	.
	Milk Production	-0.003376	0.00281	0.2322
	Exhaust relative humidity	-0.001333	0.00018	<.0001
	Ambient temperature	0.00166	0.00024	<.0001
MC-8	Intercept	7.912341	0.07564	<.0001
	Inventory	0	.	.
	Milk Production	-0.004203	0.00211	<i>0.0482</i>
	Exhaust temperature	0.002259	0.00027	<.0001
	Ambient relative humidity	-0.000841	0.00011	<.0001
MC-9	Intercept	7.803527	0.01421	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.002284	0.00035	<.0001
	Exhaust relative humidity	-0.001359	0.00018	<.0001
MC-10	Intercept	7.704265	0.0045	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.002354	0.00029	<.0001
MC-11	Intercept	7.841781	0.01365	<.0001
	Inventory	0	.	.

Model	Parameter	Estimate	Standard Error	p-value
	Exhaust relative humidity	-0.001416	0.00019	<.0001
MC-12	Intercept	7.772467	0.00806	<.0001
	Inventory	0	.	.
	Ambient temperature	0.001574	0.00018	<.0001
	Ambient relative humidity	-0.000817	0.00011	<.0001
	Intercept	7.715019	0.00322	<.0001
MC-13	Inventory	0	.	.
	Ambient temperature	0.001725	0.0002	<.0001
	Intercept	7.79443	0.00809	<.0001
MC-14	Inventory	0	.	.
	Ambient relative humidity	-0.000855	0.00011	<.0001
	Intercept	7.811649	0.01366	<.0001
MC-15	Inventory	0	.	.
	Exhaust relative humidity	-0.001331	0.00018	<.0001
	Ambient temperature	0.001667	0.00024	<.0001
	Intercept	7.762946	0.00846	<.0001
	Inventory	0	.	.
MC-16	Exhaust temperature	0.002356	0.00026	<.0001
	Ambient relative humidity	-0.000857	0.00011	<.0001
	Intercept	7.910105	0.09756	<.0001
	Milk Production	-0.003003	0.00272	0.2724
MC-17	Exhaust temperature	0.00227	0.00035	<.0001
	Exhaust relative humidity	-0.001367	0.00018	<.0001
	Intercept	7.818453	0.08025	<.0001
	Milk Production	-0.0032	0.00224	0.156
MC-18	Exhaust temperature	0.002308	0.0003	<.0001
	Intercept	7.939436	0.11836	<.0001
	Milk Production	-0.002741	0.00333	0.4125
MC-19	Exhaust relative humidity	-0.001433	0.00019	<.0001
	Intercept	7.905604	0.07678	<.0001
	Milk Production	-0.003753	0.00215	0.0824
MC-20	Ambient temperature	0.001506	0.00019	<.0001
	Ambient relative humidity	-0.000804	0.00011	<.0001
	Intercept	7.839738	0.08147	<.0001
	Milk Production	-0.003497	0.00228	0.1277
MC-21	Ambient temperature	0.001685	0.00021	<.0001
	Intercept	8.009566	0.09414	<.0001
	Milk Production	-0.006083	0.00266	<i>0.0236</i>
MC-22	Ambient relative humidity	-0.000848	0.00011	<.0001
	Intercept	7.930999	0.10033	<.0001
	Milk Production	-0.003376	0.00281	0.2322
MC-23	Exhaust relative humidity	-0.001333	0.00018	<.0001
	Ambient temperature	0.00166	0.00024	<.0001
	Intercept	7.912341	0.07564	<.0001
	Milk Production	-0.004203	0.00211	<i>0.0482</i>
MC-24	Exhaust temperature	0.002259	0.00027	<.0001
	Ambient relative humidity	-0.000841	0.00011	<.0001
	Intercept	8.173978	0.05729	<.0001
MC-25	Exhaust temperature	0.009635	0.00139	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Exhaust relative humidity	-0.005808	0.00071	<.0001
MC-26	Intercept	7.747757	0.01852	<.0001
	Exhaust temperature	0.010041	0.0012	<.0001
MC-27	Intercept	8.335064	0.0552	<.0001
	Exhaust relative humidity	-0.006048	0.00075	<.0001
MC-28	Intercept	8.042215	0.03257	<.0001
	Ambient temperature	0.006791	0.00074	<.0001
	Ambient relative humidity	-0.003552	0.00043	<.0001
MC-29	Intercept	7.792856	0.01316	<.0001
	Ambient temperature	0.007429	0.00082	<.0001
MC-30	Intercept	8.135768	0.03298	<.0001
	Ambient relative humidity	-0.003695	0.00044	<.0001
MC-31	Intercept	8.206537	0.05486	<.0001
	Exhaust relative humidity	-0.005681	0.00071	<.0001
	Ambient temperature	0.007121	0.00096	<.0001
MC-32	Intercept	8.001735	0.03418	<.0001
	Exhaust temperature	0.010115	0.00107	<.0001
	Ambient relative humidity	-0.003722	0.00043	<.0001

Table G-18. Fit and evaluation statistics for PM₁₀ emission models for dairy milking centers.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
MC-1	-1524	-1514	-1513	-1495	0.648	0.222	38.98	41.04	-0.143	-0.136
MC-2	-2084	-2076	-2076	-2060	0.565	0.228	45.4	41.34	-0.083	-0.091
MC-3	-1492	-1484	-1483	-1469	0.472	0.269	47.36	49.85	-0.103	-0.098
MC-4	-2013	-2003	-2003	-1983	0.678	0.2	39.68	36.21	-0.109	-0.119
MC-5	-2039	-2031	-2031	-2015	0.587	0.223	44.5	40.29	-0.062	-0.068
MC-6	-1972	-1964	-1964	-1948	0.486	0.255	50.22	45.99	-0.113	-0.123
MC-7	-1476	-1466	-1465	-1447	0.662	0.22	38.5	40.44	-0.114	-0.109
MC-8	-2022	-2012	-2012	-1992	0.687	0.198	39.14	35.83	-0.122	-0.134
MC-9	-1573	-1565	-1565	-1563	0.648	0.22	39.02	40.71	-0.143	-0.137
MC-10	-2131	-2125	-2125	-2124	0.561	0.228	45.61	41.36	-0.099	-0.109
MC-11	-1540	-1534	-1534	-1532	0.464	0.266	47.15	49.2	-0.095	-0.091
MC-12	-2061	-2053	-2053	-2052	0.677	0.2	39.83	36.19	-0.126	-0.138
MC-13	-2086	-2080	-2080	-2078	0.58	0.223	44.74	40.34	-0.077	-0.085
MC-14	-2017	-2011	-2011	-2010	0.425	0.262	51.9	47.3	-0.086	-0.095
MC-15	-1524	-1516	-1516	-1515	0.659	0.218	38.61	40.2	-0.115	-0.11
MC-16	-2070	-2062	-2062	-2060	0.685	0.197	39.23	35.75	-0.141	-0.155
MC-17	-1524	-1512	-1511	-1489	0.648	0.222	38.98	41.04	-0.143	-0.136
MC-18	-2084	-2074	-2074	-2054	0.565	0.228	45.4	41.34	-0.083	-0.091
MC-19	-1492	-1482	-1481	-1463	0.472	0.269	47.36	49.85	-0.103	-0.098
MC-20	-2013	-2001	-2001	-1977	0.678	0.2	39.68	36.21	-0.109	-0.119
MC-21	-2039	-2029	-2029	-2009	0.587	0.223	44.5	40.29	-0.062	-0.068
MC-22	-1972	-1962	-1962	-1942	0.486	0.255	50.22	45.99	-0.113	-0.123
MC-23	-1476	-1464	-1463	-1441	0.662	0.22	38.5	40.44	-0.114	-0.109
MC-24	-2022	-2010	-2010	-1986	0.687	0.198	39.14	35.83	-0.122	-0.134
MC-25	-664	-654	-654	-652	0.67	0.898	38.92	213.7	-3.632	-0.661
MC-26	-901	-893	-893	-891	0.581	0.954	45.54	217.4	-2.747	-0.575
MC-27	-630	-622	-622	-620	0.478	1.108	47.15	258.9	-2.222	-0.405
MC-28	-919	-909	-908	-907	0.704	0.822	39.14	187.1	-3.441	-0.72
MC-29	-888	-880	-879	-878	0.603	0.929	44.43	210.8	-2.322	-0.489
MC-30	-868	-860	-860	-859	0.44	1.11	51.95	249.2	-2.087	-0.435
MC-31	-648	-638	-638	-636	0.684	0.885	38.2	209.4	-3.064	-0.559
MC-32	-924	-914	-914	-912	0.711	0.814	38.74	185.8	-3.748	-0.781

^a Based on transformed data (i.e., ln(PM₁₀)).

^b Based on back-transformed data.

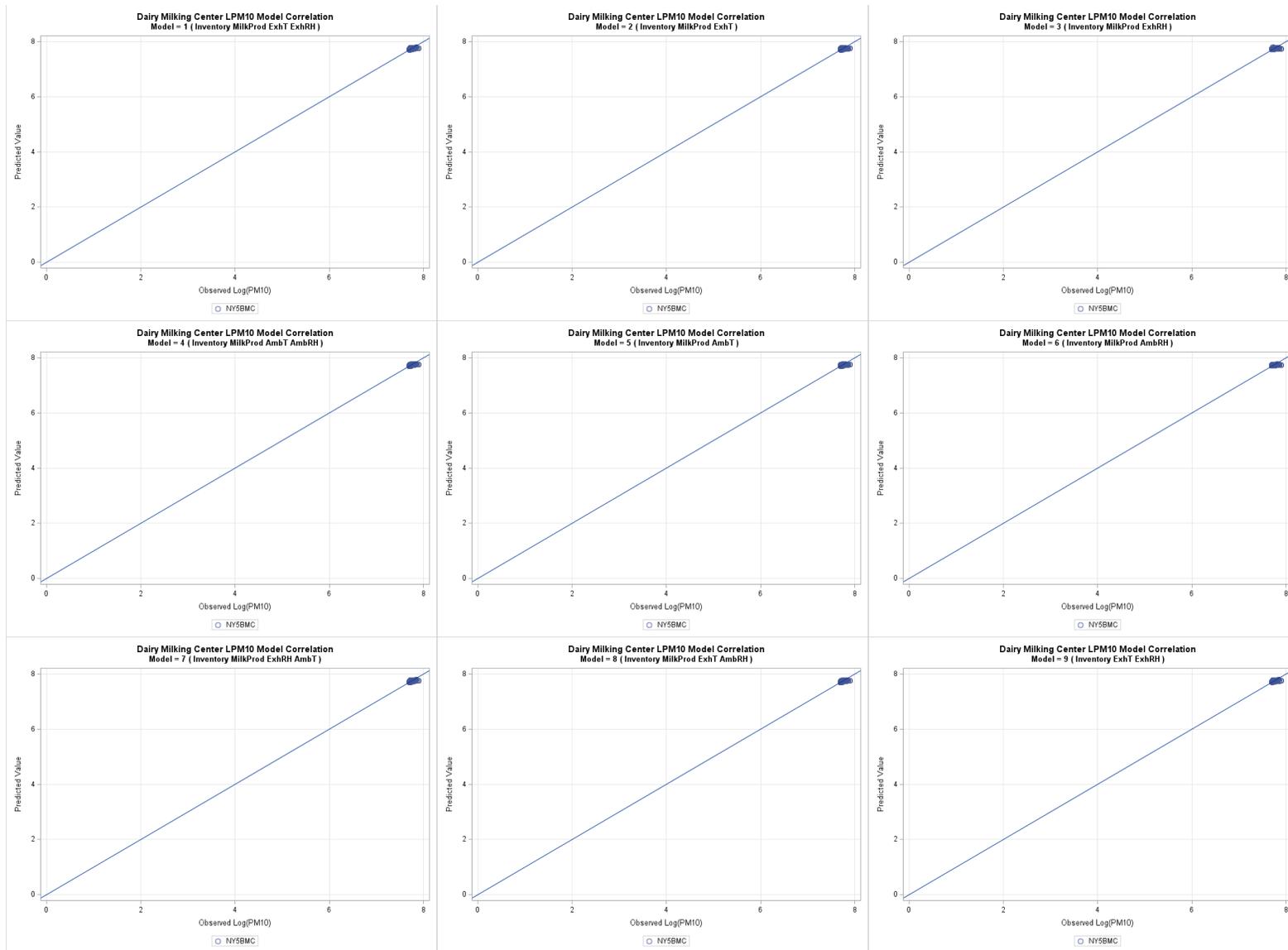


Figure G-33. Dairy milking center PM₁₀ one-to-one plots models 1 through 9, log transformed.

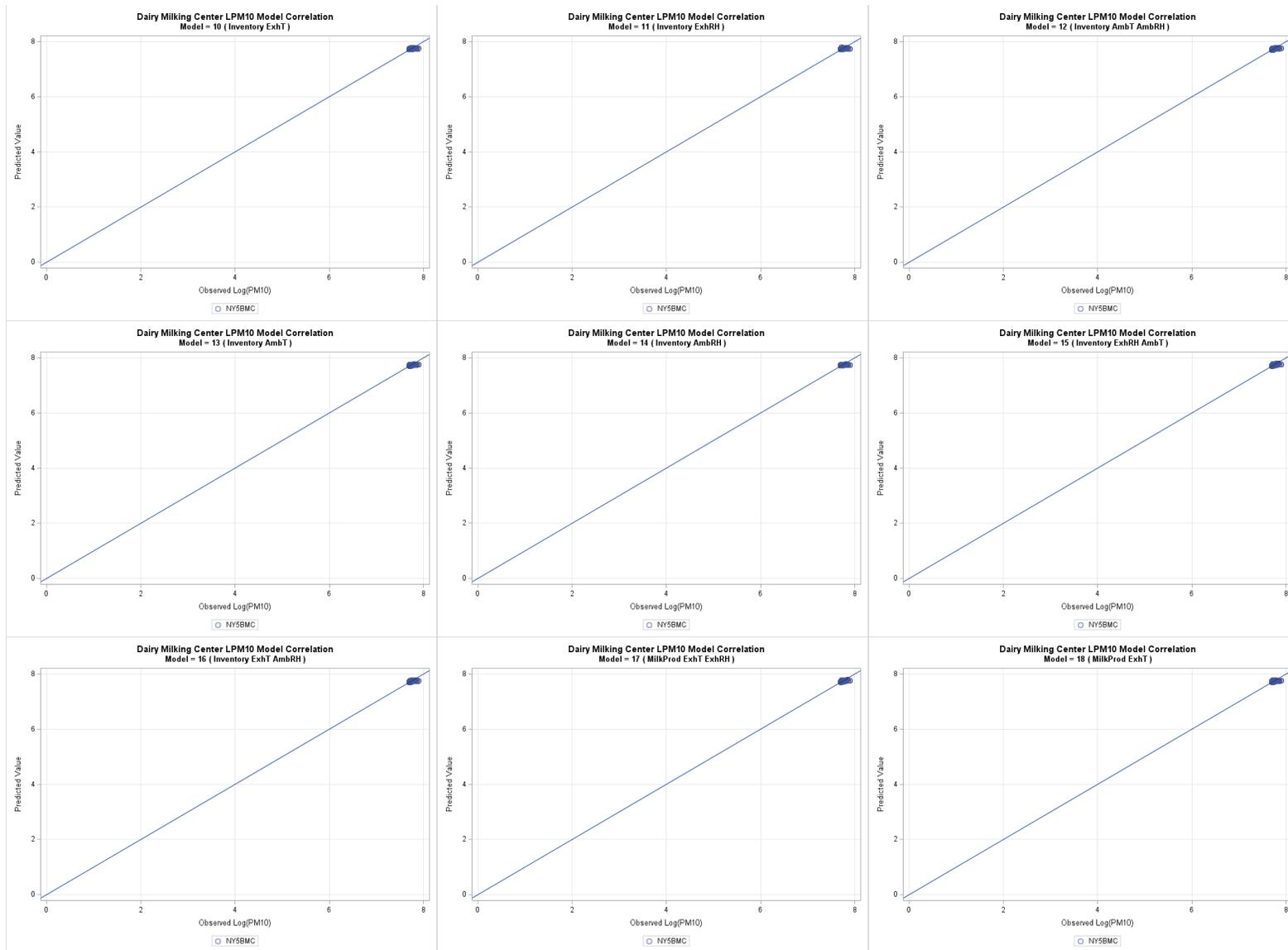


Figure G-34. Dairy milking center PM₁₀ one-to-one plots models 10 through 18, log transformed.

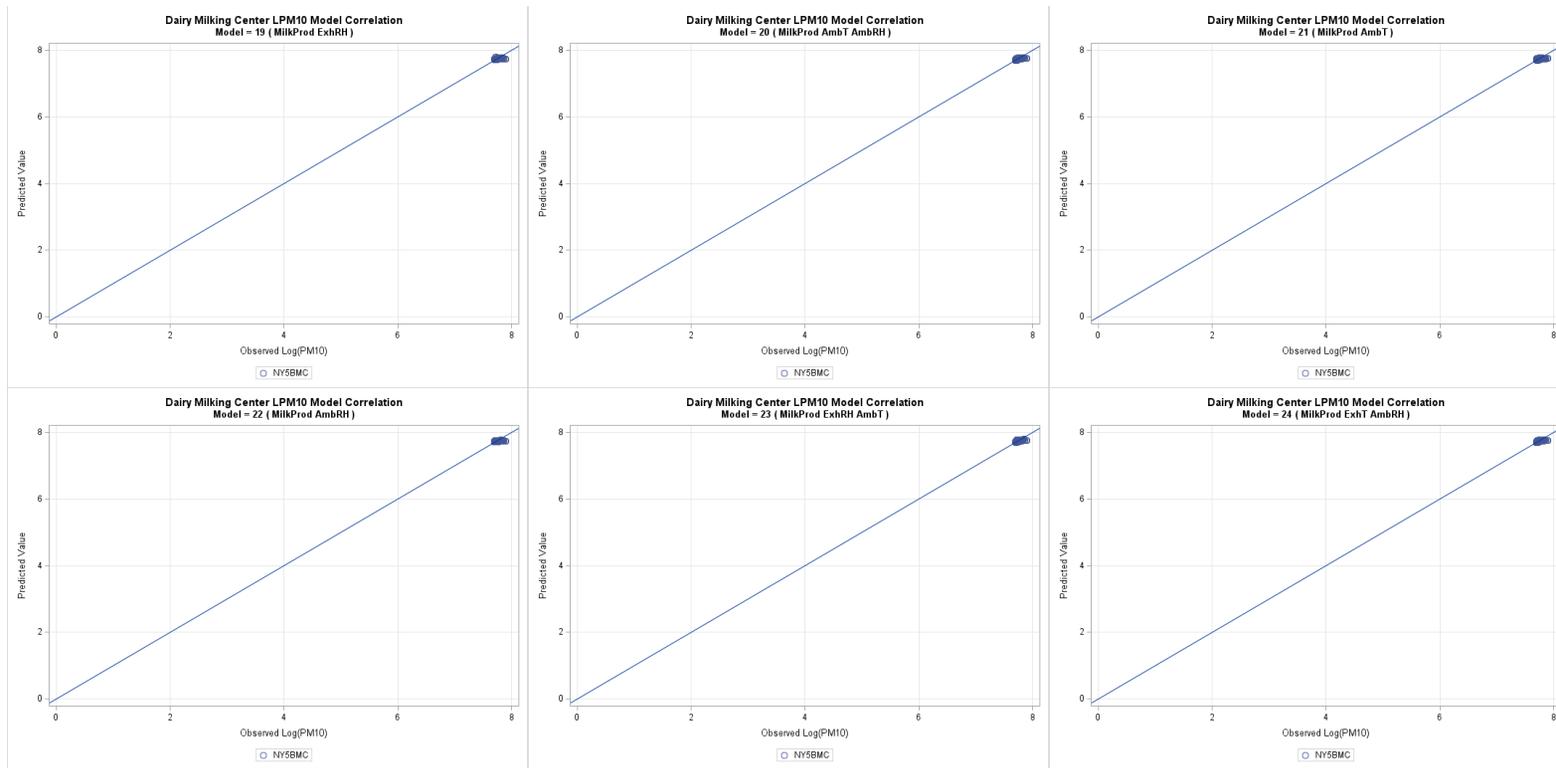


Figure G-35. Dairy milking center PM₁₀ one-to-one plots models 19 through 24, log transformed.

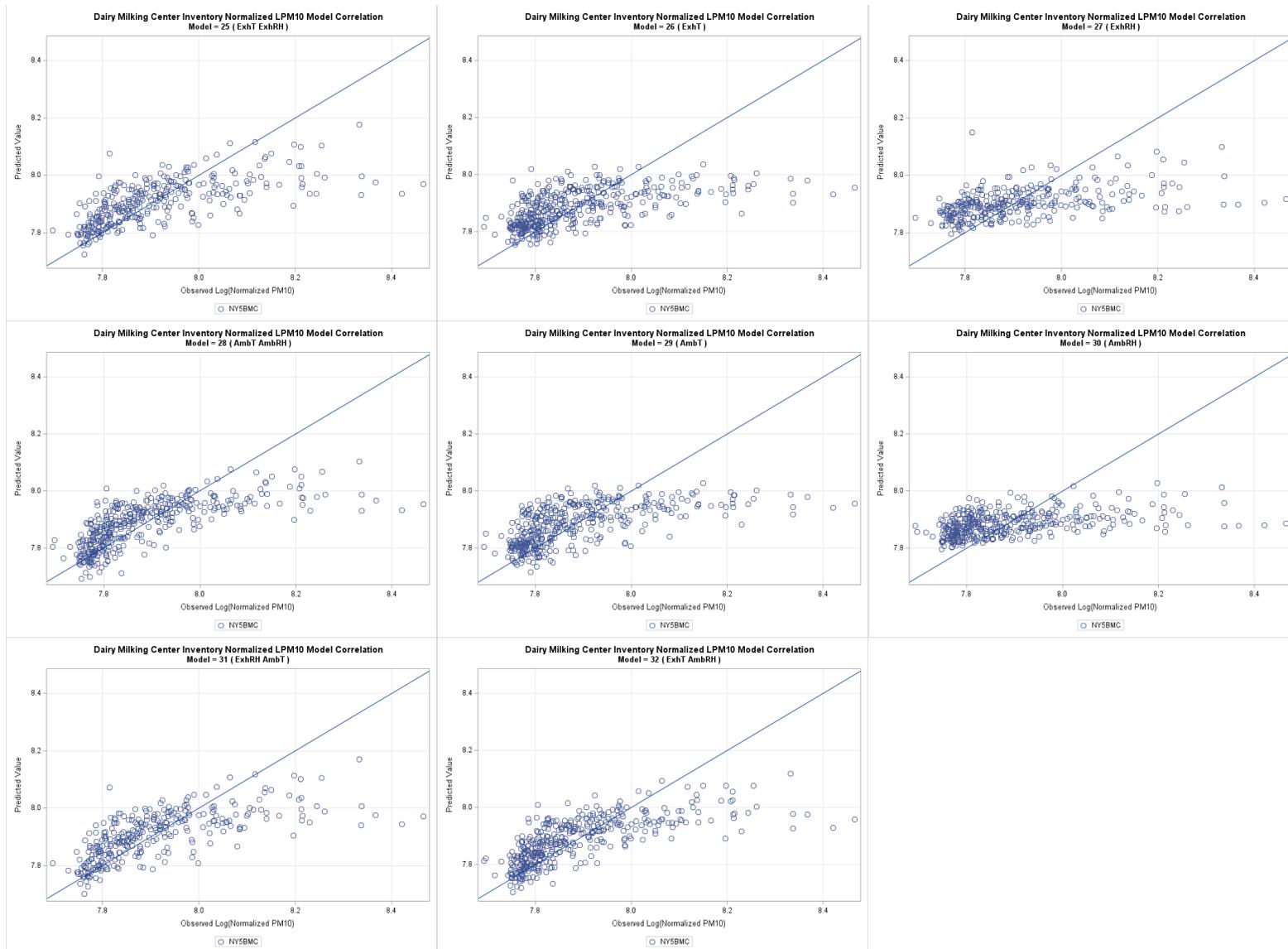


Figure G-36. Dairy milking center PM₁₀ one-to-one plots models 25 through 32, log transformed.

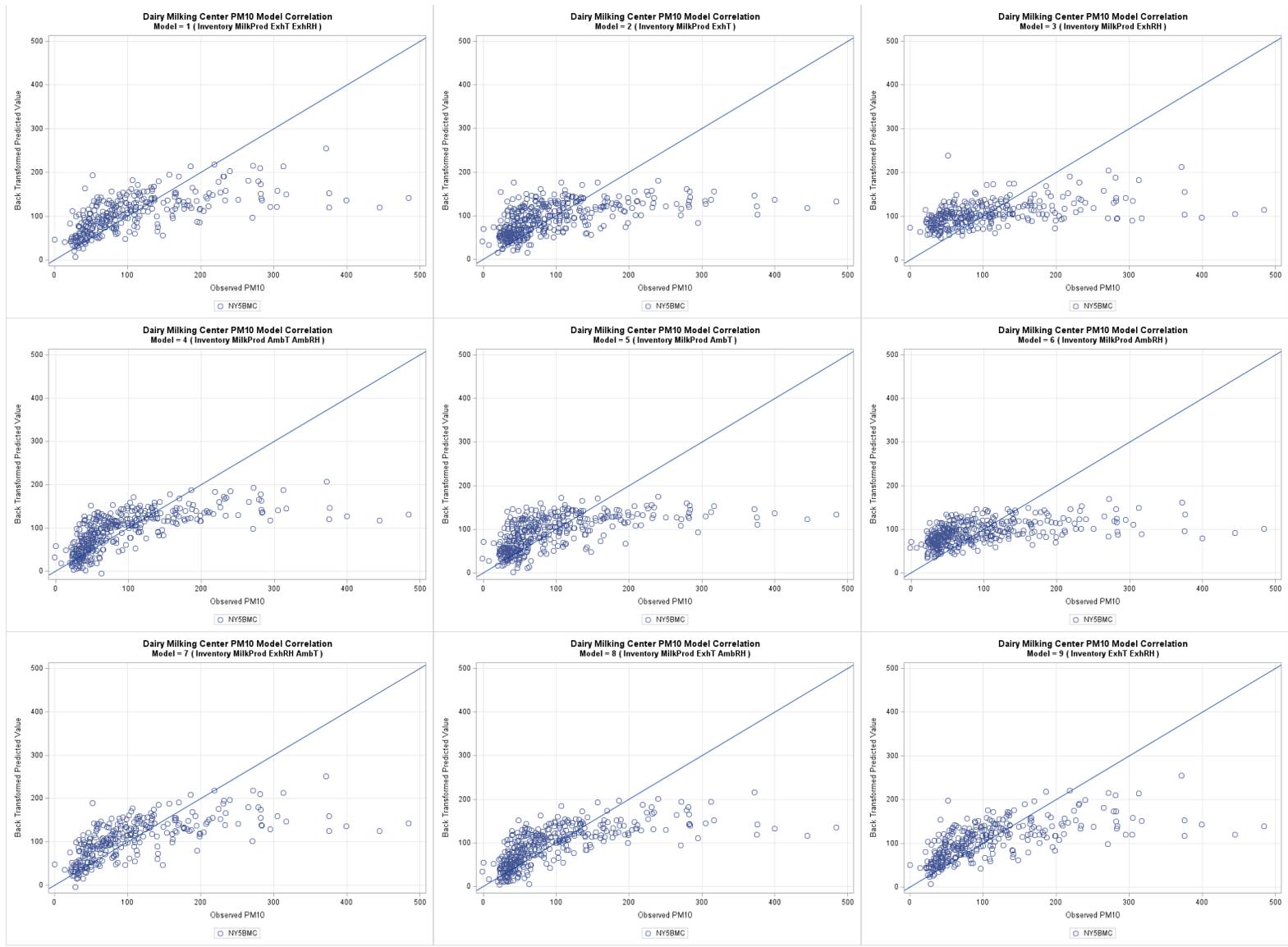


Figure G-37. Dairy milking center PM₁₀ one-to-one plots models 1 through 9, back transformed.

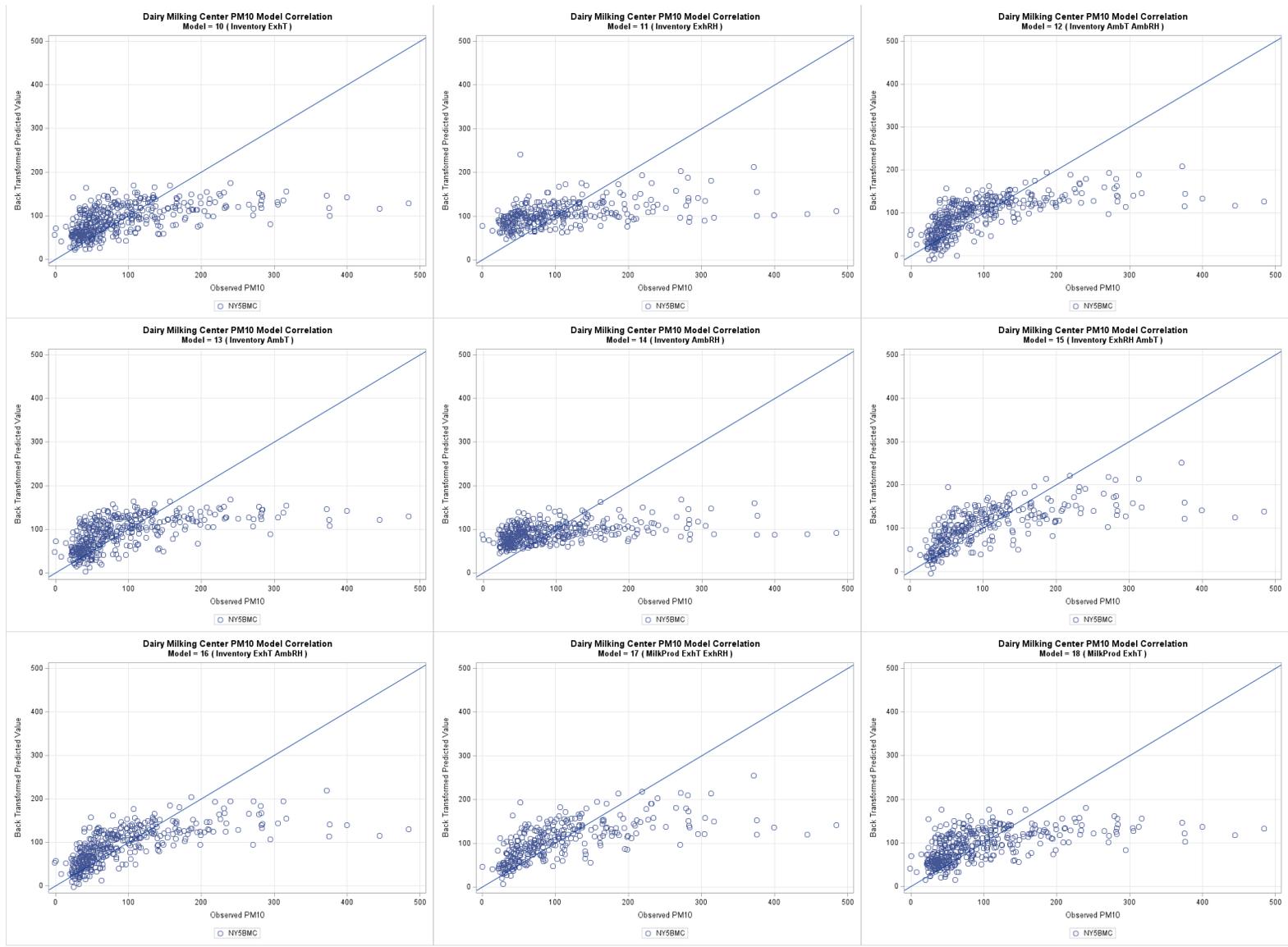


Figure G-38. Dairy milking center PM₁₀ one-to-one plots models 10 through 18, back transformed.

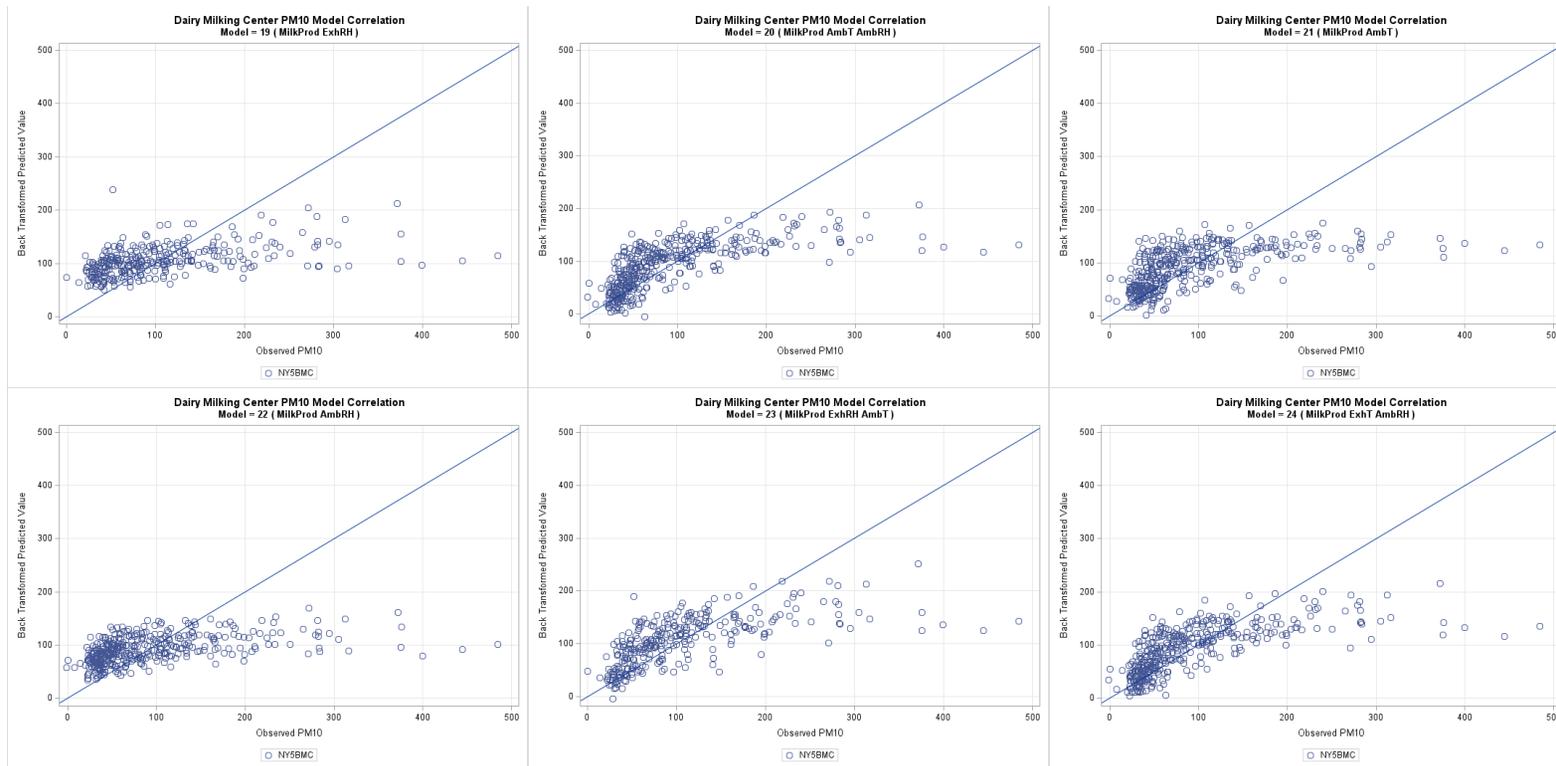


Figure G-39. Dairy milking center PM₁₀ one-to-one plots models 19 through 24, back transformed.

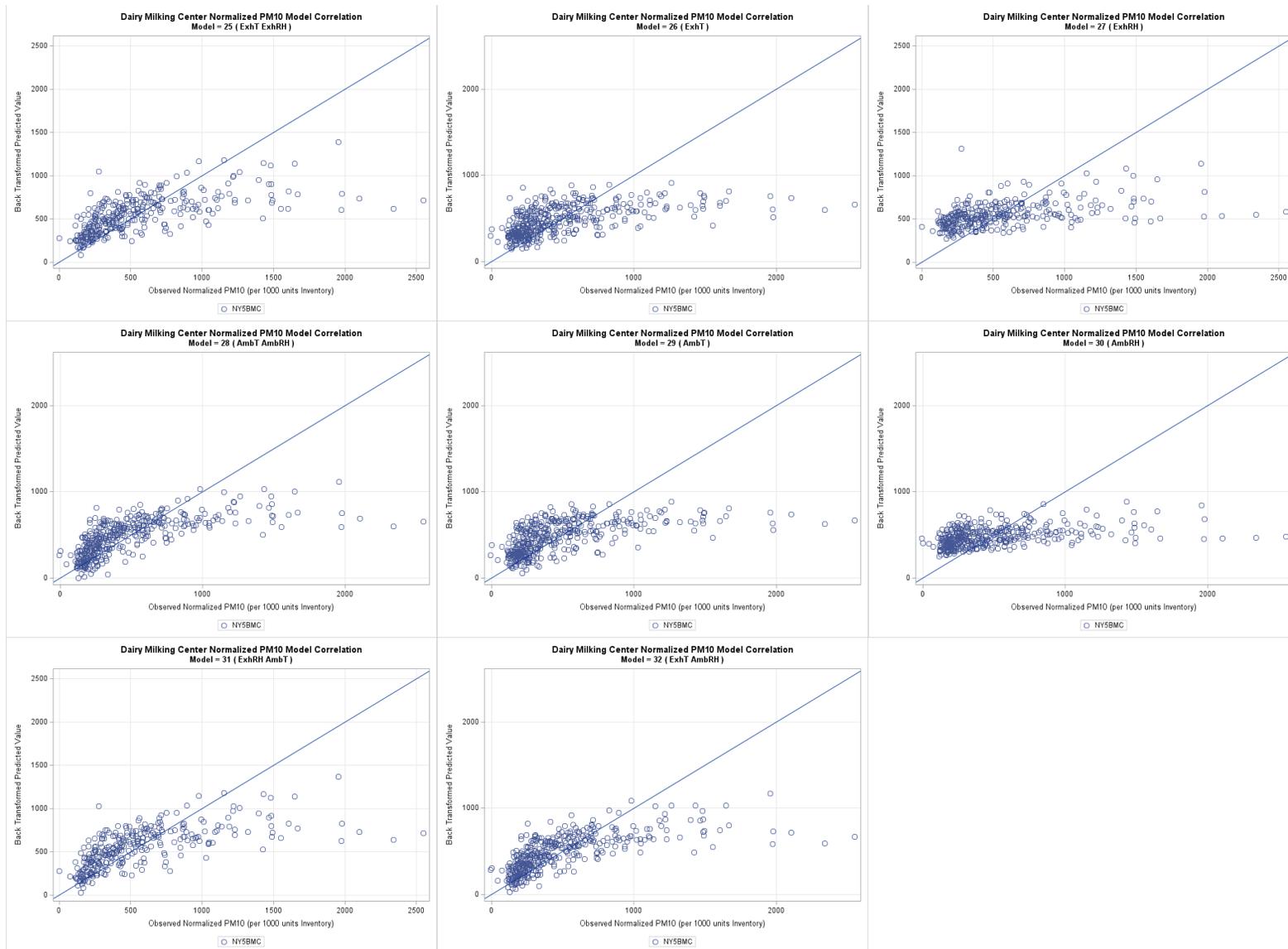


Figure G-40. Dairy milking center PM₁₀ one-to-one plots models 25 through 32, back transformed.

G.2.4 Fine particulate matter (PM_{2.5})

Table G-19. Parameter and estimates PM_{2.5} emission models for dairy milking centers.

Model	Parameter	Estimate	Standard Error	p-value
MC-1	Intercept	5.782857	0.45714	<.0001
	Inventory	0	.	.
	Milk Production	0.017245	0.01151	0.1455
	Exhaust temperature	0.005228	0.00197	<i>0.013</i>
	Exhaust relative humidity	0.001056	0.00107	0.3348
MC-2	Intercept	5.994771	0.41089	<.0001
	Inventory	0	.	.
	Milk Production	0.013925	0.01087	0.2098
	Exhaust temperature	0.004385	0.00178	<i>0.0196</i>
MC-3	Intercept	6.882941	0.21318	<.0001
	Inventory	0	.	.
	Milk Production	-0.009611	0.00604	0.13
	Exhaust relative humidity	0.000201	0.00118	0.8663
MC-4	Intercept	5.779762	0.4562	<.0001
	Inventory	0	.	.
	Milk Production	0.019436	0.01196	0.1146
	Ambient temperature	0.003482	0.00129	<i>0.0116</i>
	Ambient relative humidity	0.000509	0.00066	0.4459
MC-5	Intercept	5.910604	0.43144	<.0001
	Inventory	0	.	.
	Milk Production	0.016897	0.01169	0.1583
	Ambient temperature	0.003223	0.00127	<i>0.0164</i>
MC-6	Intercept	6.931659	0.17526	<.0001
	Inventory	0	.	.
	Milk Production	-0.010649	0.0046	<i>0.0321</i>
	Ambient relative humidity	0.000032	0.00072	0.9644
MC-7	Intercept	5.644267	0.48097	<.0001
	Inventory	0	.	.
	Milk Production	0.021724	0.01243	0.0917
	Exhaust relative humidity	0.001082	0.00106	0.3177
	Ambient temperature	0.004016	0.00143	0.0091
MC-8	Intercept	5.864775	0.43643	<.0001
	Inventory	0	.	.
	Milk Production	0.016373	0.01114	0.152
	Exhaust temperature	0.004763	0.00182	<i>0.0136</i>
	Ambient relative humidity	0.000513	0.00066	0.4447
MC-9	Intercept	6.456241	0.09142	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.002601	0.00093	<i>0.0121</i>
	Exhaust relative humidity	0.000764	0.00111	0.4987
MC-10	Intercept	6.520602	0.01278	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.002273	0.00069	0.0036

Model	Parameter	Estimate	Standard Error	p-value
MC-11	Intercept	6.571678	0.09482	<.0001
	Inventory	0	.	.
	Exhaust relative humidity	-0.000124	0.00125	0.9216
MC-12	Intercept	6.518691	0.04956	<.0001
	Inventory	0	.	.
	Ambient temperature	0.001502	0.00046	0.0037
	Ambient relative humidity	0.00021	0.00067	0.7554
MC-13	Intercept	6.533998	0.00916	<.0001
	Inventory	0	.	.
	Ambient temperature	0.001502	0.00046	0.0038
MC-14	Intercept	6.546912	0.05823	<.0001
	Inventory	0	.	.
	Ambient relative humidity	0.000172	0.0008	0.83
MC-15	Intercept	6.473366	0.08908	<.0001
	Inventory	0	.	.
	Exhaust relative humidity	0.000733	0.00112	0.5168
	Ambient temperature	0.001747	0.00063	<i>0.0128</i>
MC-16	Intercept	6.503502	0.05028	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.002275	0.00069	0.0034
	Ambient relative humidity	0.000234	0.00067	0.7276
MC-17	Intercept	5.782857	0.45714	<.0001
	Milk Production	0.017245	0.01151	0.1455
	Exhaust temperature	0.005228	0.00197	<i>0.013</i>
	Exhaust relative humidity	0.001056	0.00107	0.3348
MC-18	Intercept	5.994771	0.41089	<.0001
	Milk Production	0.013925	0.01087	0.2098
	Exhaust temperature	0.004385	0.00178	<i>0.0196</i>
MC-19	Intercept	6.882941	0.21318	<.0001
	Milk Production	-0.009611	0.00604	0.13
	Exhaust relative humidity	0.000201	0.00118	0.8663
MC-20	Intercept	5.779762	0.4562	<.0001
	Milk Production	0.019436	0.01196	0.1146
	Ambient temperature	0.003482	0.00129	<i>0.0116</i>
	Ambient relative humidity	0.000509	0.00066	0.4459
MC-21	Intercept	5.910604	0.43144	<.0001
	Milk Production	0.016897	0.01169	0.1583
	Ambient temperature	0.003223	0.00127	<i>0.0164</i>
MC-22	Intercept	6.931659	0.17526	<.0001
	Milk Production	-0.010649	0.0046	<i>0.0321</i>
	Ambient relative humidity	0.000032	0.00072	0.9644
MC-23	Intercept	5.644267	0.48097	<.0001
	Milk Production	0.021724	0.01243	0.0917
	Exhaust relative humidity	0.001082	0.00106	0.3177
	Ambient temperature	0.004016	0.00143	0.0091
MC-24	Intercept	5.864775	0.43643	<.0001
	Milk Production	0.016373	0.01114	0.152
	Exhaust temperature	0.004763	0.00182	<i>0.0136</i>

Model	Parameter	Estimate	Standard Error	p-value
	Ambient relative humidity	0.000513	0.00066	0.4447
MC-25	Intercept	6.289348	0.32603	<.0001
	Exhaust temperature	0.011374	0.00333	0.003
	Exhaust relative humidity	0.002775	0.00397	0.4911
MC-26	Intercept	6.524119	0.04565	<.0001
	Exhaust temperature	0.010128	0.00246	0.0005
MC-27	Intercept	6.7872	0.35897	<.0001
	Exhaust relative humidity	-0.001024	0.00472	0.83
MC28	Intercept	6.525115	0.17709	<.0001
	Ambient temperature	0.006696	0.00163	0.0006
	Ambient relative humidity	0.000805	0.00239	0.7383
MC-29	Intercept	6.58377	0.03273	<.0001
	Ambient temperature	0.006698	0.00164	0.0006
MC-30	Intercept	6.653836	0.22324	<.0001
	Ambient relative humidity	0.000586	0.00306	0.8492
MC-31	Intercept	6.363494	0.31761	<.0001
	Exhaust relative humidity	0.002645	0.00398	0.5118
	Ambient temperature	0.007648	0.00225	0.0032
MC-32	Intercept	6.457625	0.17955	<.0001
	Exhaust temperature	0.010136	0.00245	0.0005
	Ambient relative humidity	0.00091	0.00238	0.7045

Table G-20. Fit and evaluation statistics for PM_{2.5} emission models for dairy milking centers.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
MC-1	-161	-151	-149	-142	0.432	0.242	41.4	11.78	-0.004	-0.013
MC-2	-180	-172	-171	-165	0.459	0.213	38.83	10.31	-0.004	-0.014
MC-3	-155	-147	-146	-140	0.244	0.244	41.87	11.91		
MC-4	-181	-171	-169	-162	0.476	0.229	41.72	11.08	-0.005	-0.018
MC-5	-180	-172	-171	-165	0.466	0.223	40.57	10.78	-0.005	-0.017
MC-6	-174	-166	-165	-159	0.331	0.223	40.89	10.86	-0.001	-0.003
MC-7	-162	-152	-150	-143	0.448	0.248	42.25	12.02	-0.006	-0.019
MC-8	-180	-170	-169	-161	0.469	0.222	40.67	10.8	-0.004	-0.014
MC-9	-159	-151	-150	-149	0.383	0.229	39.22	11.16	-0.003	-0.012
MC-10	-178	-172	-171	-171	0.429	0.208	38.02	10.1	-0.003	-0.012
MC-11	-152	-146	-146	-145	0.017	0.266	45.31	12.89		
MC-12	-178	-170	-169	-168	0.429	0.214	39	10.36	-0.003	-0.013
MC-13	-178	-172	-171	-171	0.427	0.211	38.69	10.28	-0.003	-0.013
MC-14	-170	-164	-163	-162	0.043	0.272	49.27	13.09		-0.001
MC-15	-159	-151	-150	-149	0.382	0.232	39.5	11.24	-0.004	-0.013
MC-16	-178	-170	-169	-169	0.431	0.211	38.51	10.23	-0.003	-0.012
MC-17	-161	-149	-146	-139	0.432	0.242	41.4	11.78	-0.004	-0.013
MC-18	-180	-170	-168	-161	0.459	0.213	38.83	10.31	-0.004	-0.014
MC-19	-155	-145	-143	-136	0.244	0.244	41.87	11.91		
MC-20	-181	-169	-166	-158	0.476	0.229	41.72	11.08	-0.005	-0.018
MC-21	-180	-170	-168	-161	0.466	0.223	40.57	10.78	-0.005	-0.017
MC-22	-174	-164	-163	-155	0.331	0.223	40.89	10.86	-0.001	-0.003
MC-23	-162	-150	-147	-139	0.448	0.248	42.25	12.02	-0.006	-0.019
MC-24	-180	-168	-166	-158	0.469	0.222	40.67	10.8	-0.004	-0.014
MC-25	-57	-47	-45	-45	0.455	0.9	38.63	57.85	-0.245	-0.163
MC-26	-66	-58	-57	-56	0.509	0.832	37.75	52.77	-0.242	-0.173
MC-27	-48	-40	-39	-39	0.040	1.079	45.16	67.63	0.015	0.010
MC-28	-66	-56	-54	-54	0.509	0.85	38.41	53.69	-0.260	-0.186
MC-29	-66	-58	-57	-56	0.507	0.842	38.2	53.4	-0.248	-0.177
MC-30	-54	-46	-45	-45	0.044	1.131	49.22	68.8	-0.011	-0.008
MC-31	-57	-47	-45	-45	0.454	0.912	38.91	58.27	-0.254	-0.170
MC-32	-66	-56	-55	-54	0.512	0.839	37.97	53.08	-0.255	-0.183

^a Based on transformed data (i.e., $\ln(\text{PM}_{2.5})$).

^b Based on back-transformed data.

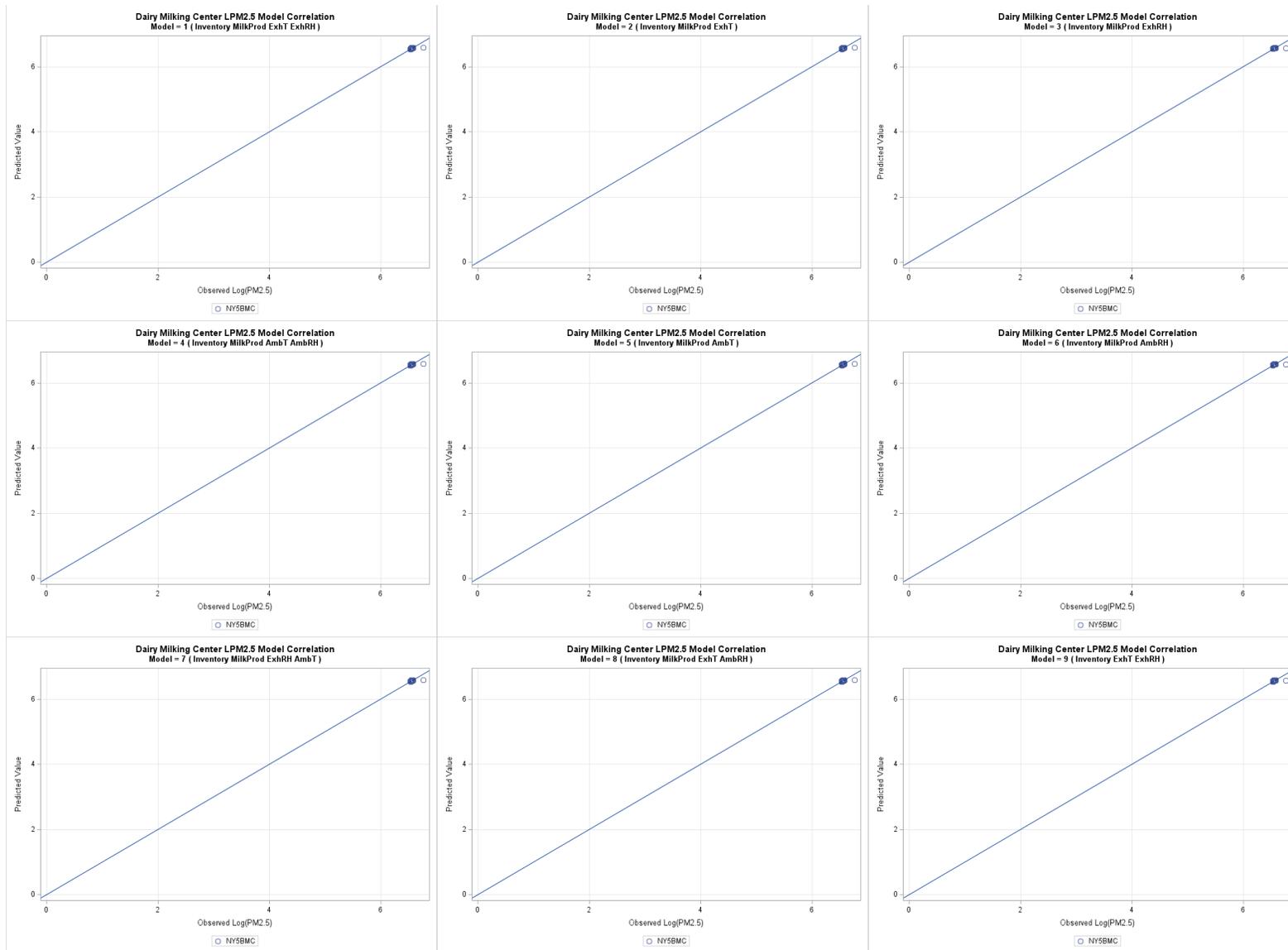


Figure G-41. Dairy milking center PM_{2.5} one-to-one plots models 1 through 9, log transformed.

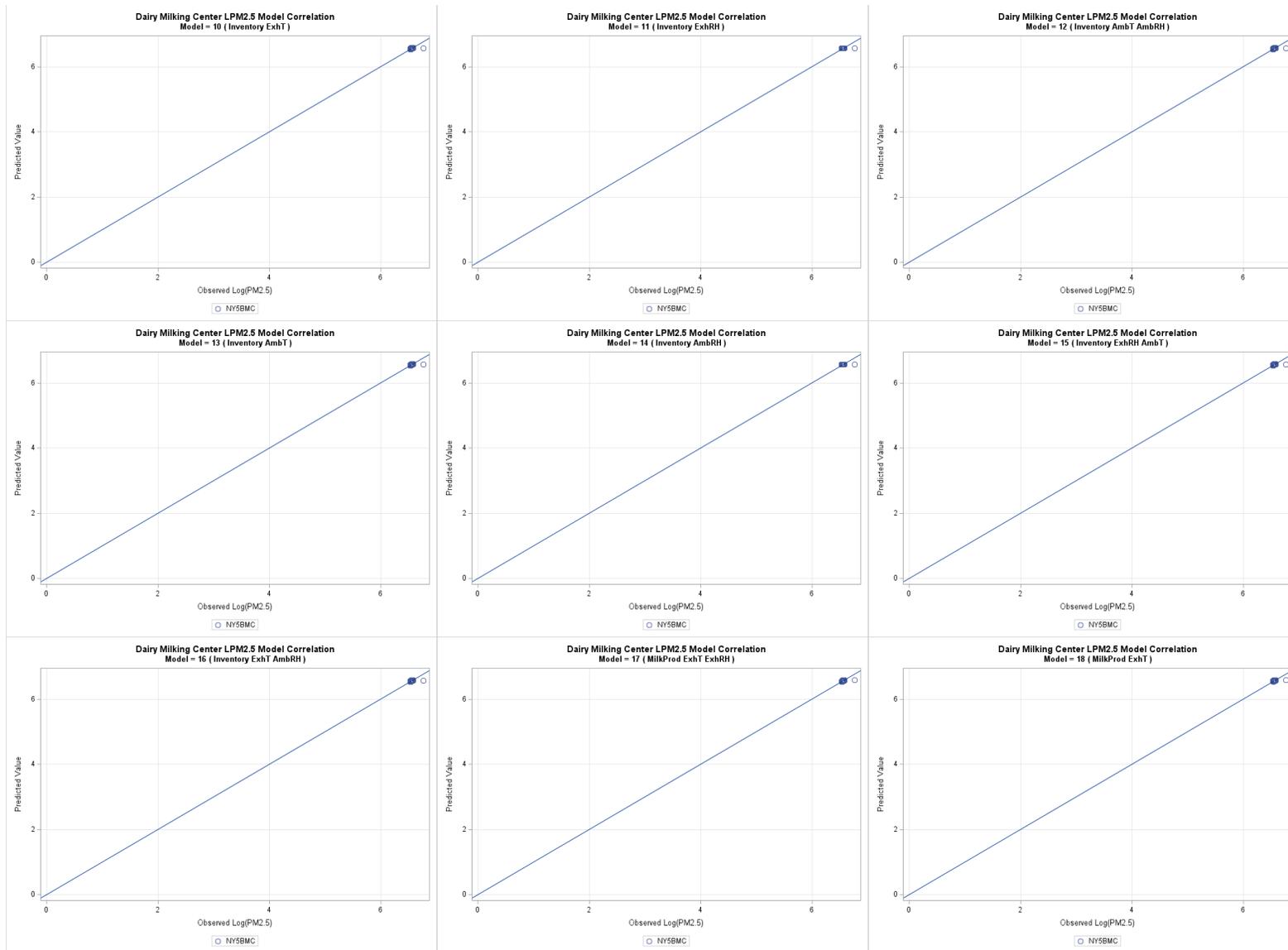


Figure G-42. Dairy milking center PM_{2.5} one-to-one plots models 10 through 18, log transformed.

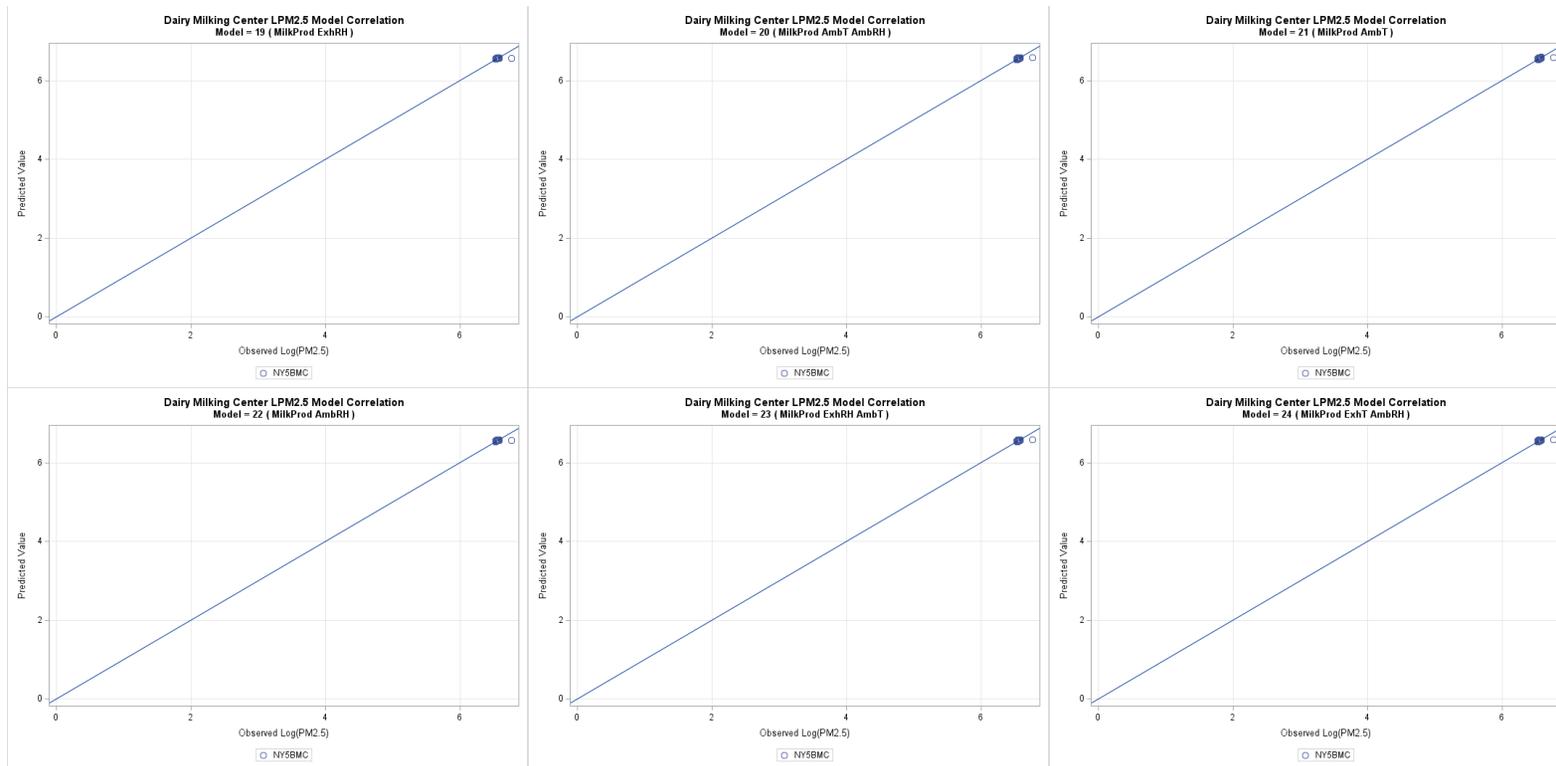


Figure G-43. Dairy milking center PM_{2.5} one-to-one plots models 19 through 24, log transformed.

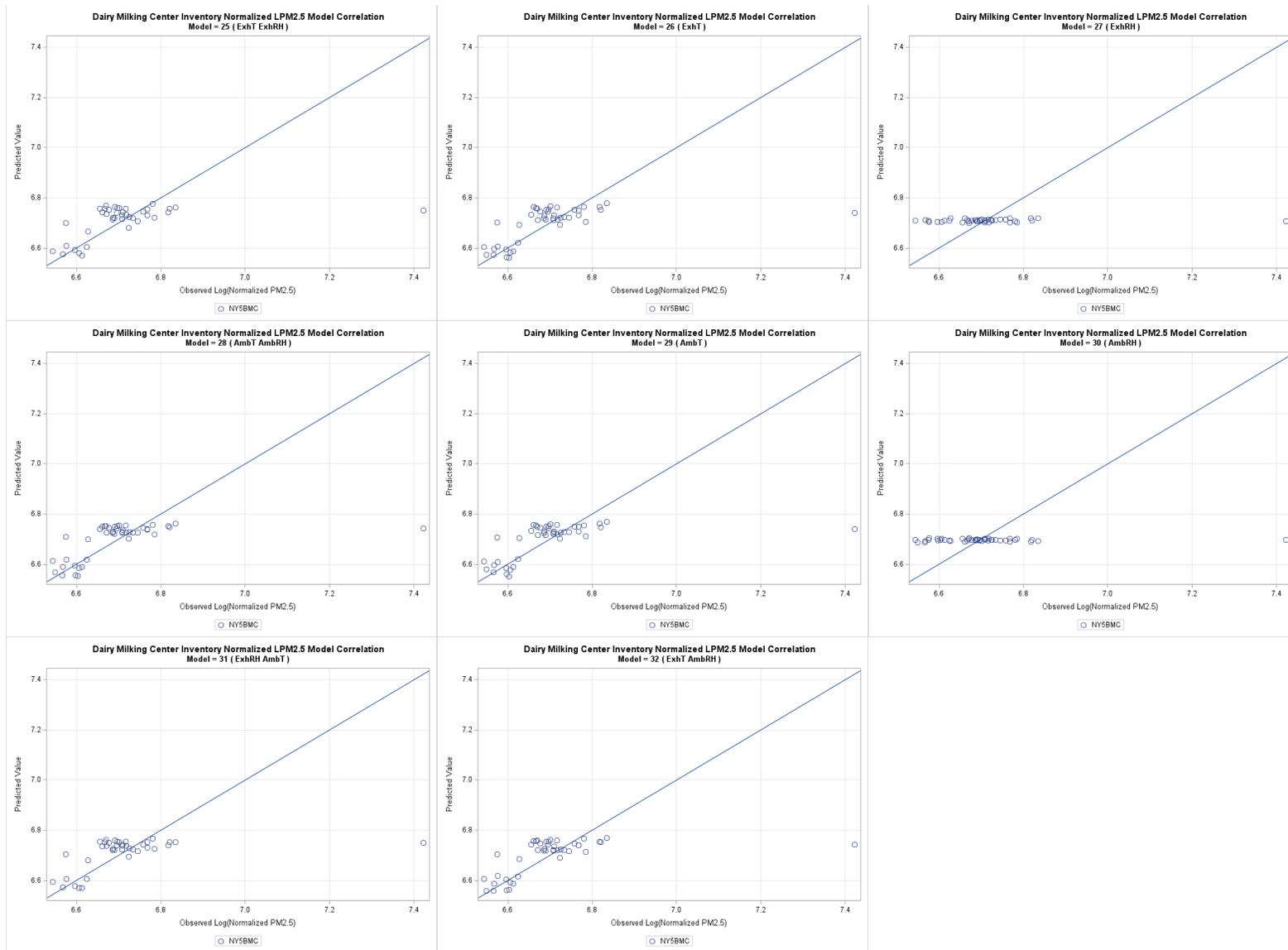


Figure G-44. Dairy milking center PM_{2.5} one-to-one plots models 25 through 32, log transformed.

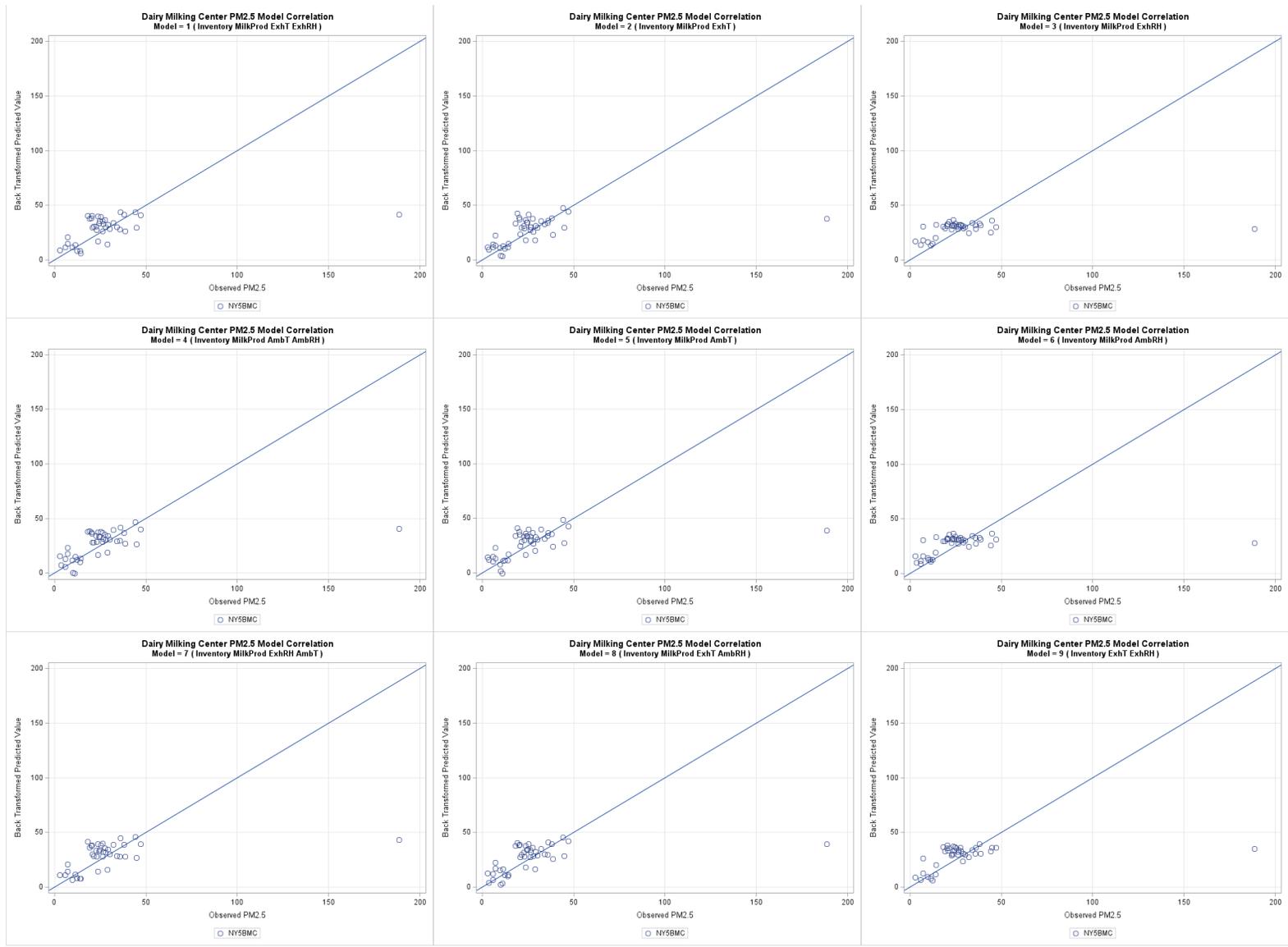


Figure G-45. Dairy milking center PM_{2.5} one-to-one plots models 1 through 9, back transformed.

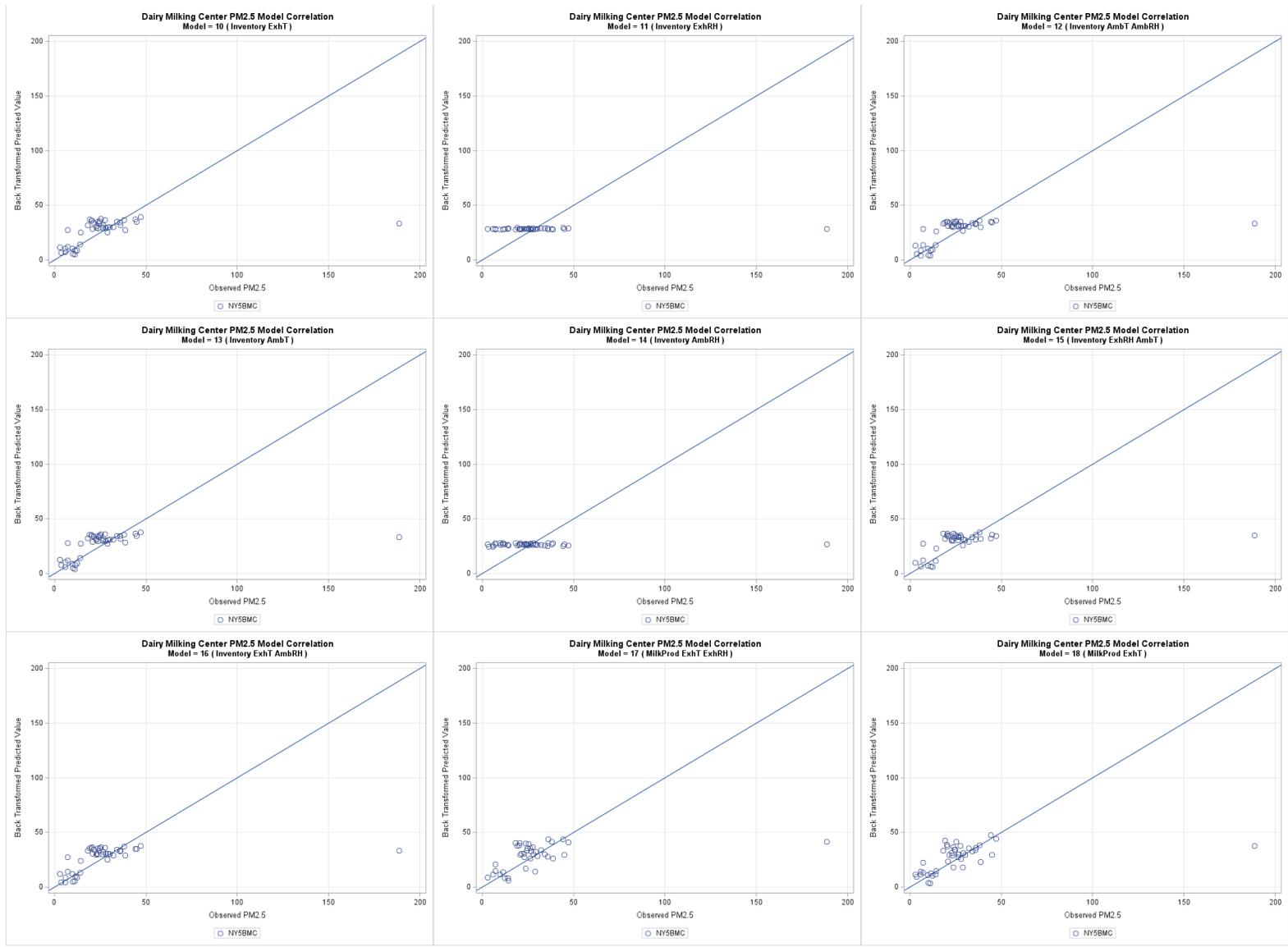


Figure G-46. Dairy milking center PM_{2.5} one-to-one plots models 10 through 18, back transformed.

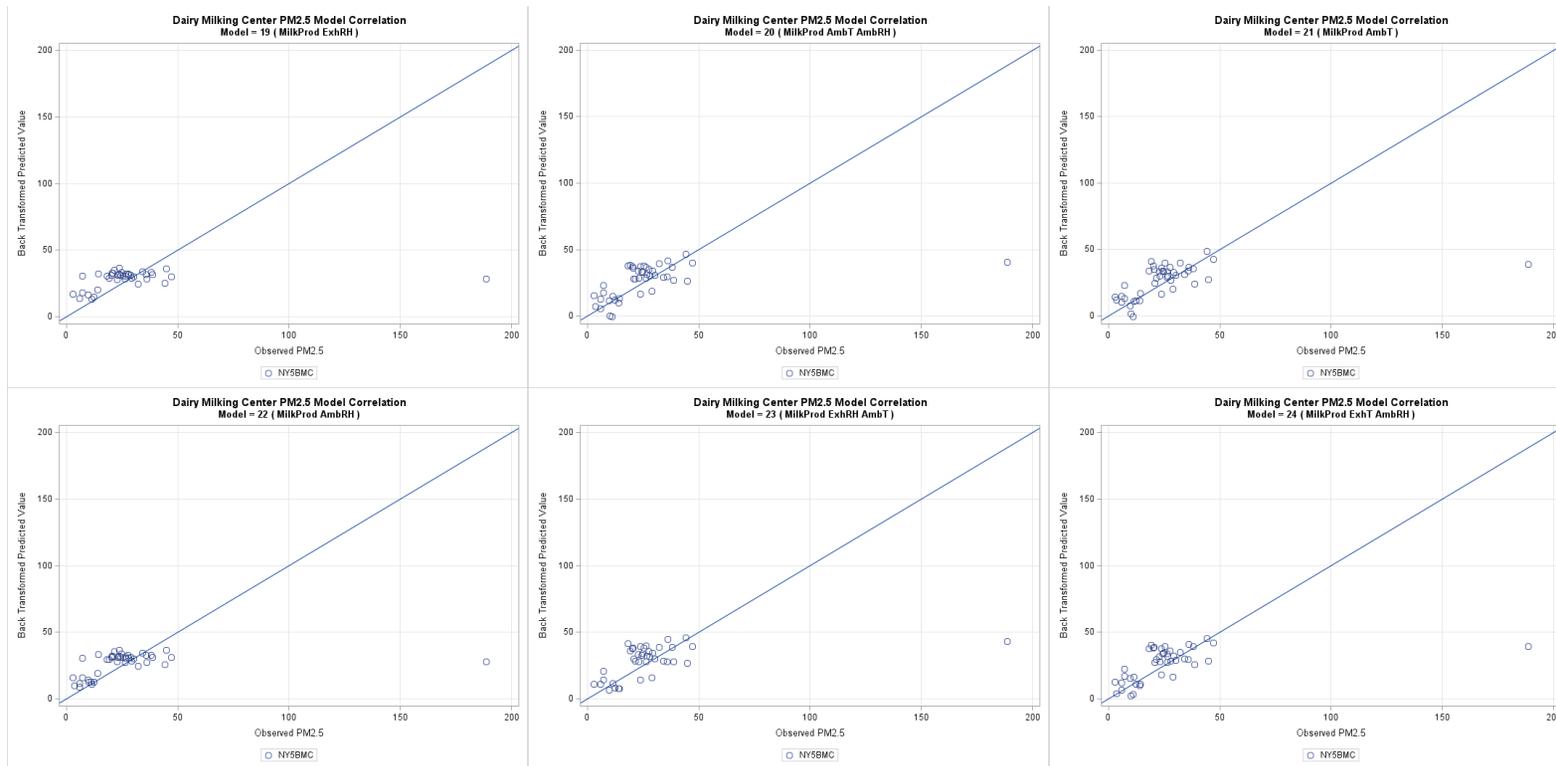


Figure G-47. Dairy milking center PM_{2.5} one-to-one plots models 19 through 24, back transformed.

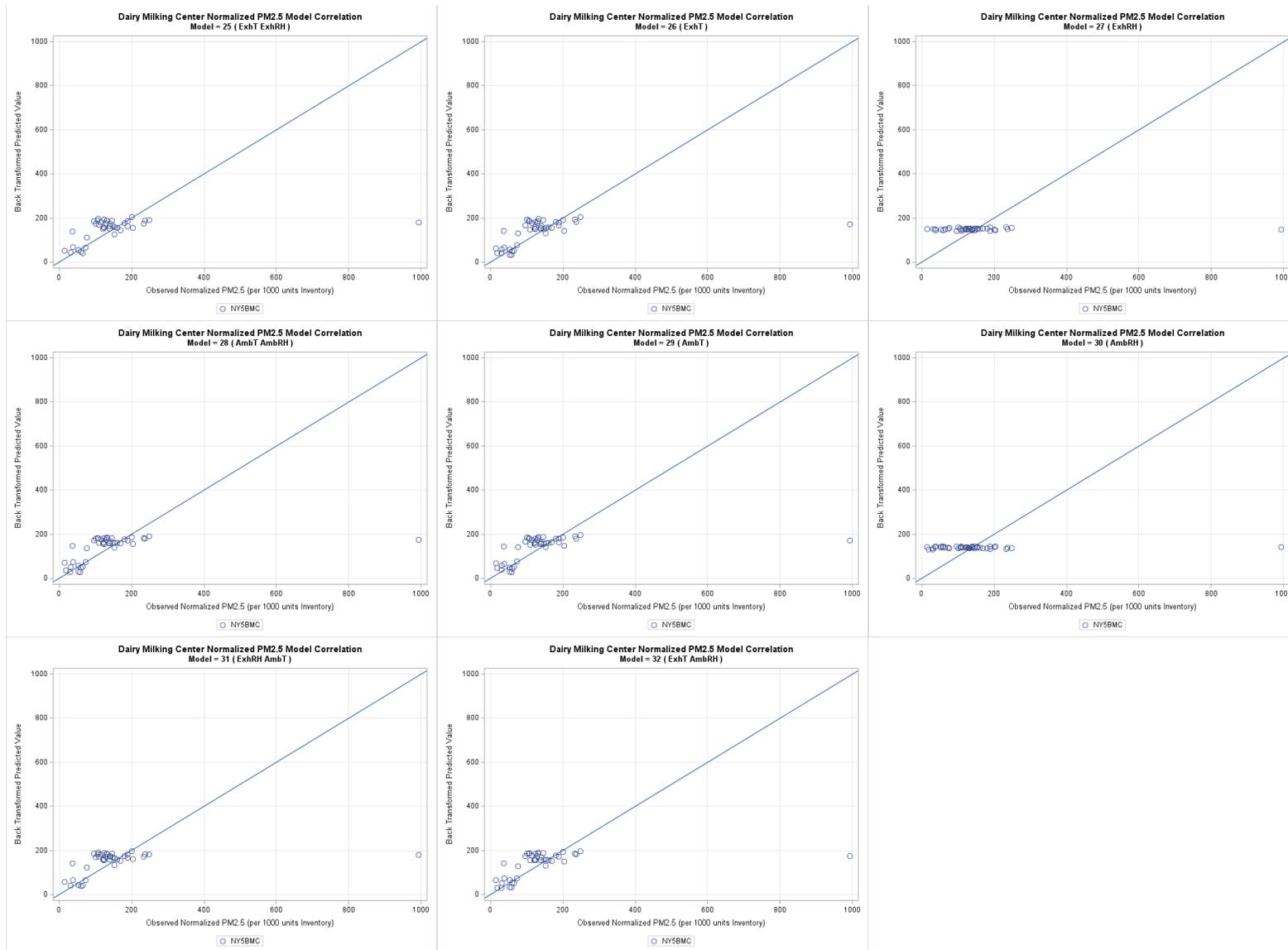


Figure G-48. Dairy milking center PM_{2.5} one-to-one plots models 25 through 32, back transformed.

G.2.5 Total Suspended Particulates (TSP)

Table G-21. Parameter and estimates TSP emission models for dairy milking centers.

Model	Parameter	Estimate	Standard Error	p-value
MC-1	Intercept	7.417305	1.47685	<.0001
	Inventory	0	.	.
	Milk Production	-0.009841	0.04316	0.8215
	Exhaust temperature	0.005685	0.00354	0.1232
	Exhaust relative humidity	-0.002283	0.00192	0.2463
MC-2	Intercept	6.873533	0.80906	<.0001
	Inventory	0	.	.
	Milk Production	0.001702	0.02286	0.9415
	Exhaust temperature	0.004185	0.00187	<i>0.041</i>
MC-3	Intercept	6.155982	1.33907	0.0004
	Inventory	0	.	.
	Milk Production	0.029139	0.03836	0.4599
	Exhaust relative humidity	-0.002728	0.00197	0.1788
MC-4	Intercept	6.805037	0.83171	<.0001
	Inventory	0	.	.
	Milk Production	0.007334	0.02365	0.7602
	Ambient temperature	0.002678	0.00133	0.0636
	Ambient relative humidity	-0.001591	0.00124	0.2091
MC-5	Intercept	6.849108	0.81895	<.0001
	Inventory	0	.	.
	Milk Production	0.003034	0.02308	0.8969
	Ambient temperature	0.0028	0.0013	<i>0.0488</i>
MC-6	Intercept	6.582306	0.93037	<.0001
	Inventory	0	.	.
	Milk Production	0.014791	0.02636	0.5815
	Ambient relative humidity	-0.001797	0.00126	0.1649
MC-7	Intercept	7.24242	1.50524	<.0001
	Inventory	0	.	.
	Milk Production	-0.004363	0.04392	0.9217
	Exhaust relative humidity	-0.002037	0.00195	0.3085
	Ambient temperature	0.003466	0.0025	0.1813
MC-8	Intercept	6.836392	0.81838	<.0001
	Inventory	0	.	.
	Milk Production	0.00605	0.0233	0.7982
	Exhaust temperature	0.004136	0.0019	<i>0.0462</i>
	Ambient relative humidity	-0.001729	0.00123	0.1707
MC-9	Intercept	7.050905	0.1357	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.005687	0.00299	0.08
	Exhaust relative humidity	-0.001897	0.00179	0.2974
MC-10	Intercept	6.934518	0.02998	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.004622	0.0019	<i>0.0256</i>
MC-11	Intercept	7.141007	0.13383	<.0001
	Inventory	0	.	.

Model	Parameter	Estimate	Standard Error	p-value
	Exhaust relative humidity	-0.001912	0.00184	0.3067
MC-12	Intercept	7.040962	0.08412	<.0001
	Inventory	0	.	.
	Ambient temperature	0.003156	0.00135	<i>0.0331</i>
	Ambient relative humidity	-0.001202	0.00118	0.3164
MC-13	Intercept	6.958684	0.02208	<.0001
	Inventory	0	.	.
	Ambient temperature	0.003141	0.0013	<i>0.0277</i>
MC-14	Intercept	7.087242	0.08557	<.0001
	Inventory	0	.	.
	Ambient relative humidity	-0.00134	0.00122	0.279
MC-15	Intercept	7.058876	0.13559	<.0001
	Inventory	0	.	.
	Exhaust relative humidity	-0.001574	0.0018	0.3881
	Ambient temperature	0.003772	0.00205	0.0925
MC-16	Intercept	7.025749	0.08501	<.0001
	Inventory	0	.	.
	Exhaust temperature	0.004751	0.00197	<i>0.0277</i>
	Ambient relative humidity	-0.001355	0.00118	0.2587
MC-17	Intercept	7.417305	1.47685	<.0001
	Milk Production	-0.009841	0.04316	0.8215
	Exhaust temperature	0.005685	0.00354	0.1232
	Exhaust relative humidity	-0.002283	0.00192	0.2463
MC-18	Intercept	6.873533	0.80906	<.0001
	Milk Production	0.001702	0.02286	0.9415
	Exhaust temperature	0.004185	0.00187	<i>0.041</i>
MC-19	Intercept	6.155982	1.33907	0.0004
	Milk Production	0.029139	0.03836	0.4599
	Exhaust relative humidity	-0.002728	0.00197	0.1788
MC-20	Intercept	6.805037	0.83171	<.0001
	Milk Production	0.007334	0.02365	0.7602
	Ambient temperature	0.002678	0.00133	0.0636
	Ambient relative humidity	-0.001591	0.00124	0.2091
MC-21	Intercept	6.849108	0.81895	<.0001
	Milk Production	0.003034	0.02308	0.8969
	Ambient temperature	0.0028	0.0013	<i>0.0488</i>
MC-22	Intercept	6.582306	0.93037	<.0001
	Milk Production	0.014791	0.02636	0.5815
	Ambient relative humidity	-0.001797	0.00126	0.1649
MC-23	Intercept	7.24242	1.50524	<.0001
	Milk Production	-0.004363	0.04392	0.9217
	Exhaust relative humidity	-0.002037	0.00195	0.3085
	Ambient temperature	0.003466	0.0025	0.1813
MC-24	Intercept	6.836392	0.81838	<.0001
	Milk Production	0.00605	0.0233	0.7982
	Exhaust temperature	0.004136	0.0019	<i>0.0462</i>
	Ambient relative humidity	-0.001729	0.00123	0.1707
MC-25	Intercept	7.439891	0.46903	<.0001
	Exhaust temperature	0.020743	0.01092	0.0789

Model	Parameter	Estimate	Standard Error	p-value
	Exhaust relative humidity	-0.005608	0.00618	0.3709
MC-26	Intercept	7.123716	0.10967	<.0001
	Exhaust temperature	0.016156	0.00699	<i>0.0327</i>
MC-27	Intercept	7.748619	0.46313	<.0001
	Exhaust relative humidity	-0.005395	0.00636	0.4029
MC28	Intercept	7.457268	0.2912	<.0001
	Ambient temperature	0.010997	0.00497	<i>0.0417</i>
	Ambient relative humidity	-0.003639	0.00409	0.3791
MC-29	Intercept	7.209101	0.08119	<.0001
	Ambient temperature	0.010892	0.00482	<i>0.0372</i>
MC-30	Intercept	7.604712	0.29594	<.0001
	Ambient relative humidity	-0.003934	0.00421	0.3562
MC-31	Intercept	7.472509	0.46839	<.0001
	Exhaust relative humidity	-0.004474	0.0062	0.4758
	Ambient temperature	0.013728	0.00753	0.0941
MC-32	Intercept	7.402084	0.29449	<.0001
	Exhaust temperature	0.016685	0.00723	<i>0.0336</i>
	Ambient relative humidity	-0.004162	0.00407	0.3139

Table G-22. Fit and evaluation statistics for TSP emission models for dairy milking centers.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
MC-1	-75	-65	-63	-58	0.475	0.872	54.48	66.33	-0.004	-0.004
MC-2	-95	-87	-85	-80	0.469	0.746	50.28	57.72	-0.115	-0.1
MC-3	-73	-65	-63	-59	0.302	0.904	58.22	70.87	-0.109	-0.09
MC-4	-96	-86	-84	-78	0.475	0.726	48.79	56	-0.076	-0.066
MC-5	-94	-86	-85	-80	0.454	0.739	49.96	57.35	-0.094	-0.082
MC-6	-92	-84	-83	-78	0.232	0.855	59.18	67.94	-0.044	-0.038
MC-7	-75	-65	-62	-58	0.441	0.882	55.02	66.98	0.041	0.034
MC-8	-96	-86	-84	-79	0.497	0.726	48.66	55.86	-0.091	-0.08
MC-9	-87	-79	-78	-78	0.412	0.869	50.89	67.38	0.164	0.124
MC-10	-107	-101	-100	-100	0.468	0.774	48.47	60.45	-0.117	-0.093
MC-11	-84	-78	-77	-76	0.001	1.006	59.85	79.23	0.172	0.13
MC-12	-108	-100	-99	-98	0.448	0.767	47.73	59.53	-0.008	-0.007
MC-13	-107	-101	-100	-100	0.462	0.768	48.2	60.11	-0.102	-0.081
MC-14	-103	-97	-96	-96	0.013	0.923	58.99	73.58	0.121	0.097
MC-15	-87	-79	-77	-77	0.405	0.883	51.7	68.45	0.149	0.112
MC-16	-108	-100	-99	-99	0.456	0.765	47.66	59.44		
MC-17	-75	-63	-59	-55	0.475	0.872	54.48	66.33	-0.004	-0.004
MC-18	-95	-85	-82	-77	0.469	0.746	50.28	57.72	-0.115	-0.1
MC-19	-73	-63	-60	-56	0.302	0.904	58.22	70.87	-0.109	-0.09
MC-20	-96	-84	-81	-75	0.475	0.726	48.79	56	-0.076	-0.066
MC-21	-94	-84	-82	-76	0.454	0.739	49.96	57.35	-0.094	-0.082
MC-22	-92	-82	-80	-74	0.232	0.855	59.18	67.94	-0.044	-0.038
MC-23	-75	-63	-59	-54	0.441	0.882	55.02	66.98	0.041	0.034
MC-24	-96	-84	-81	-75	0.497	0.726	48.66	55.86	-0.091	-0.08
MC-25	-2	8	10	10	0.412	2.939	50.43	351.4	2.215	0.318
MC-26	-7	1	2	3	0.454	2.636	48.44	318	-3.004	-0.458
MC-27	2	10	11	11	-0.031	3.415	59.87	417.2	1.988	0.285
MC-28	-7	3	4	5	0.43	2.618	47.65	312.8	-1.787	-0.272
MC-29	-7	1	2	3	0.444	2.609	48.38	317.6	-3.03	-0.462
MC-30	-3	5	6	7	-0.008	3.139	58.97	387.1	1.453	0.221
MC-31	-2	8	10	10	0.402	2.991	51.18	356.7	1.494	0.214
MC-32	-8	2	4	4	0.441	2.612	47.48	311.7	-1.317	-0.201

^a Based on transformed data (i.e., ln(TSP)).

^b Based on back-transformed data.

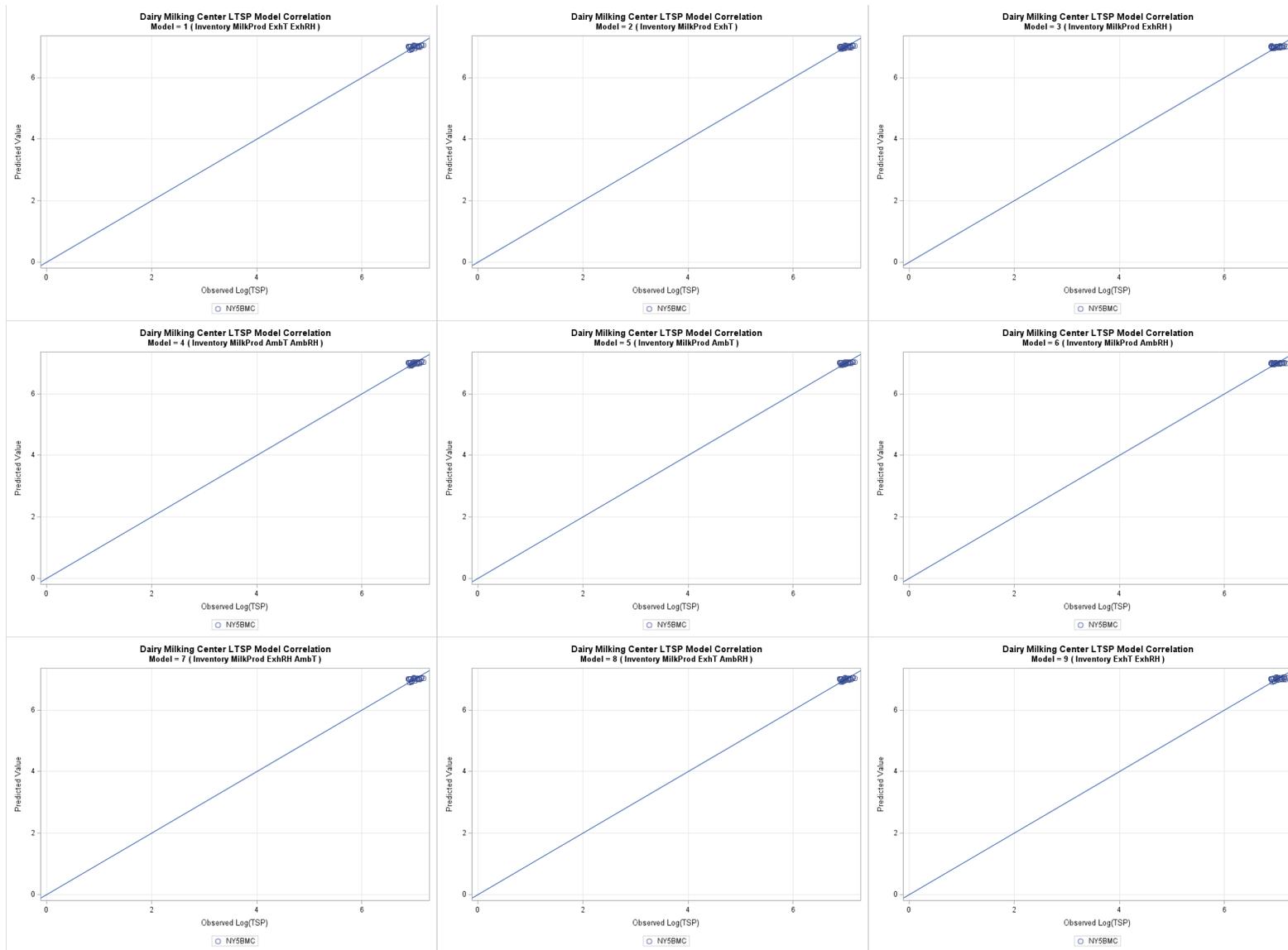


Figure G-49. Dairy milking center TSP one-to-one plots models 1 through 9, log transformed.

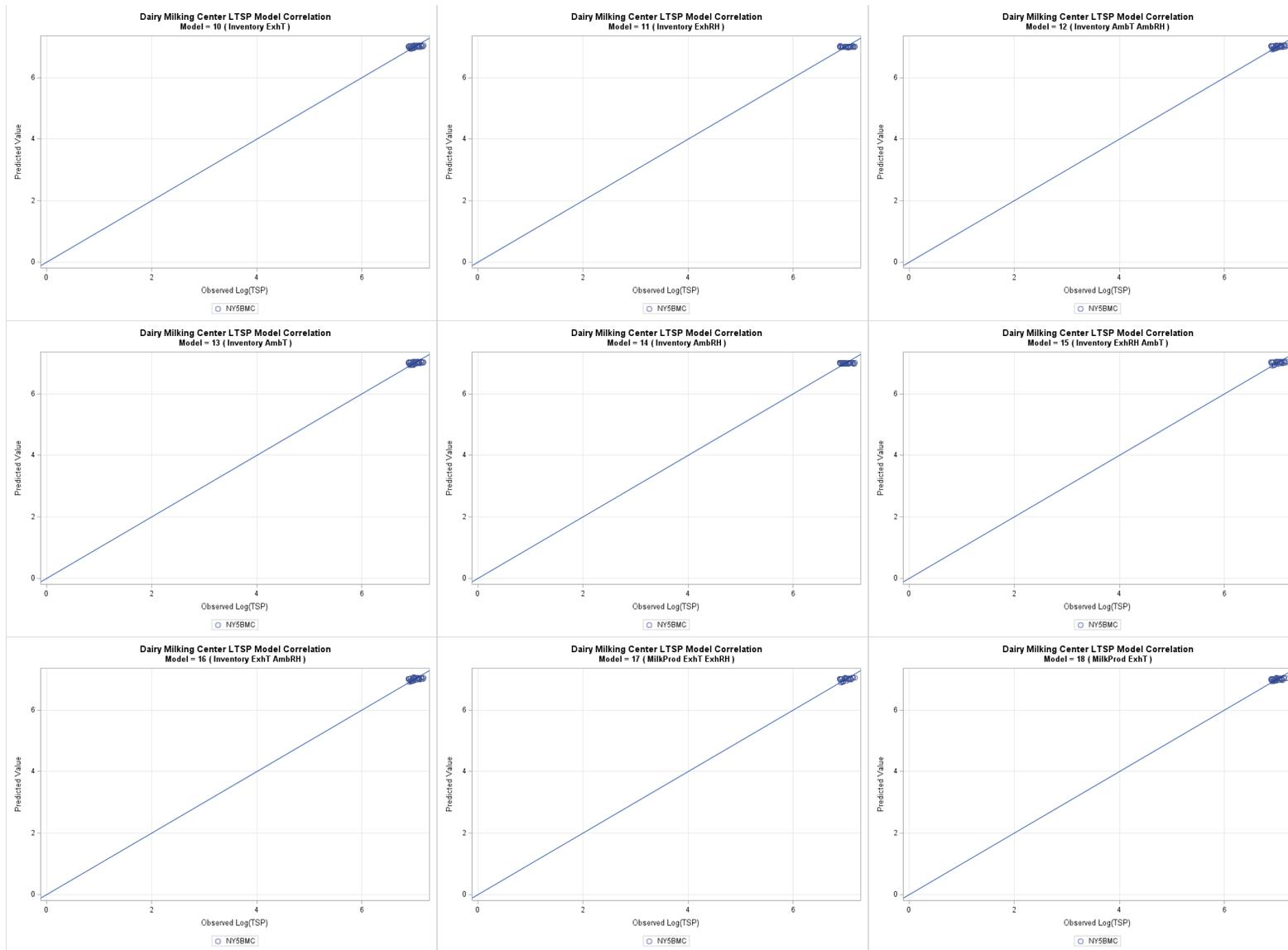


Figure G-50. Dairy milking center TSP one-to-one plots models 10 through 18, log transformed.

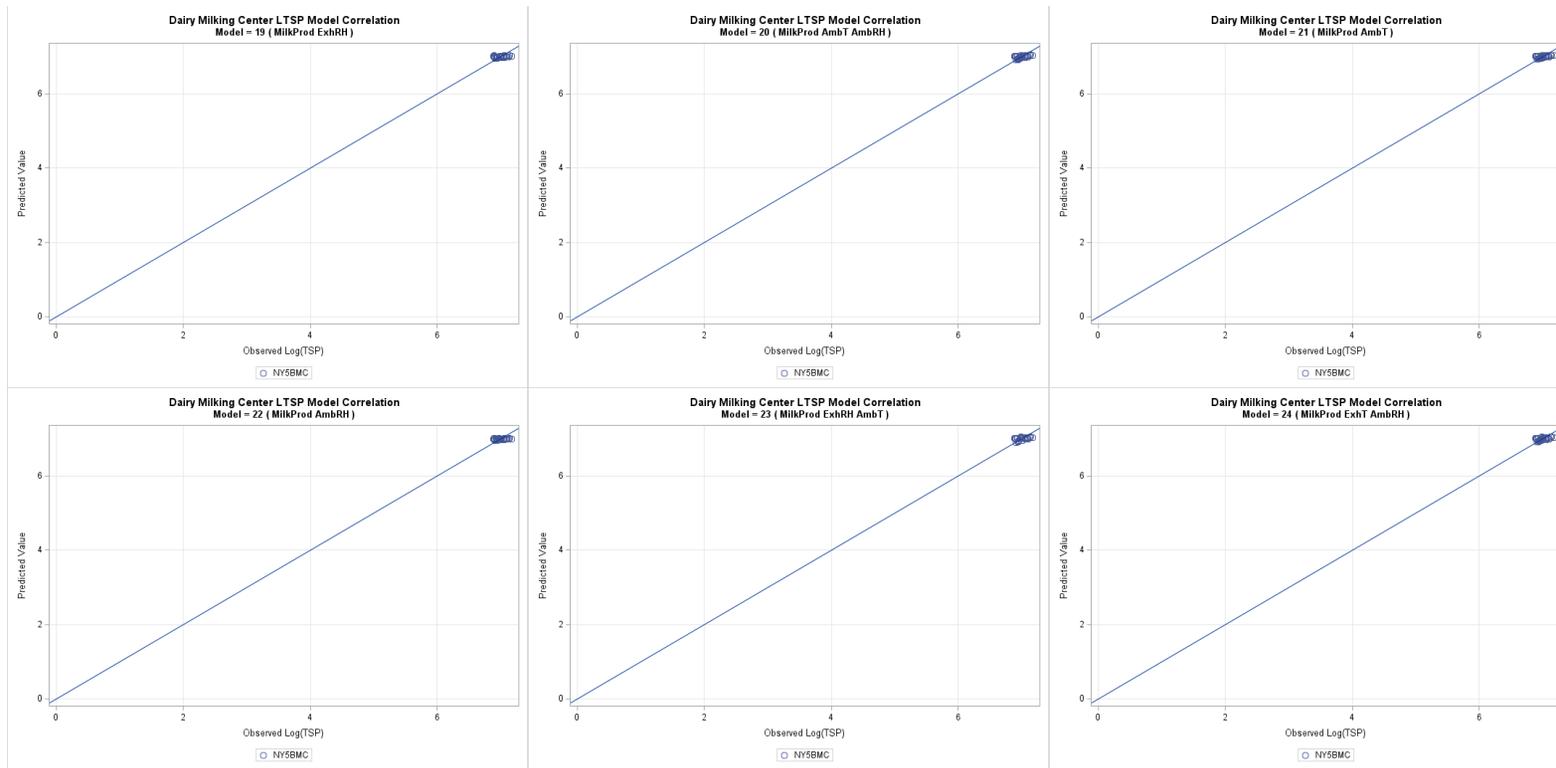


Figure G-51. Dairy milking center TSP one-to-one plots models 19 through 24, log transformed.

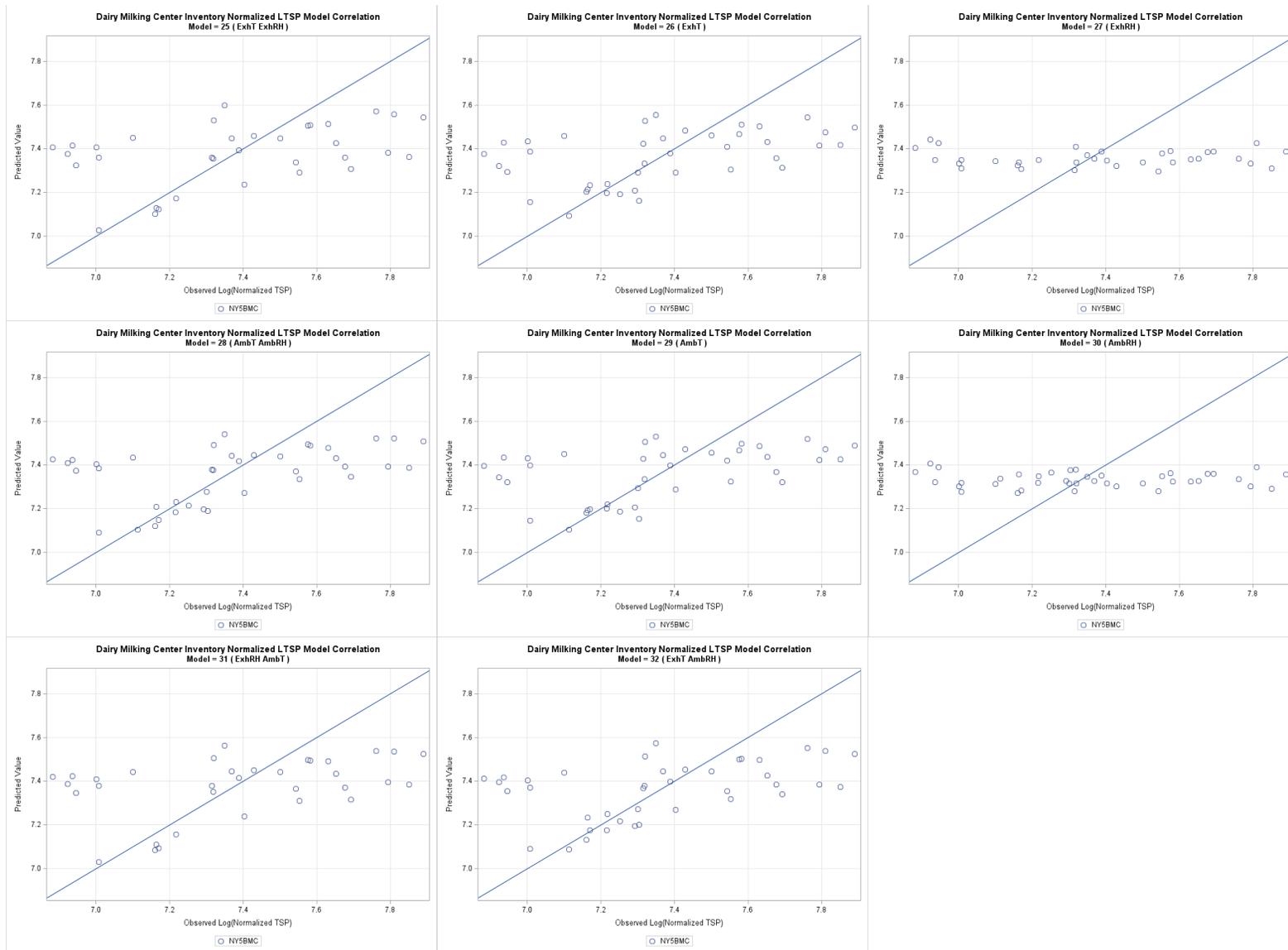


Figure G-52. Dairy milking center TSP one-to-one plots models 25 through 32, log transformed.

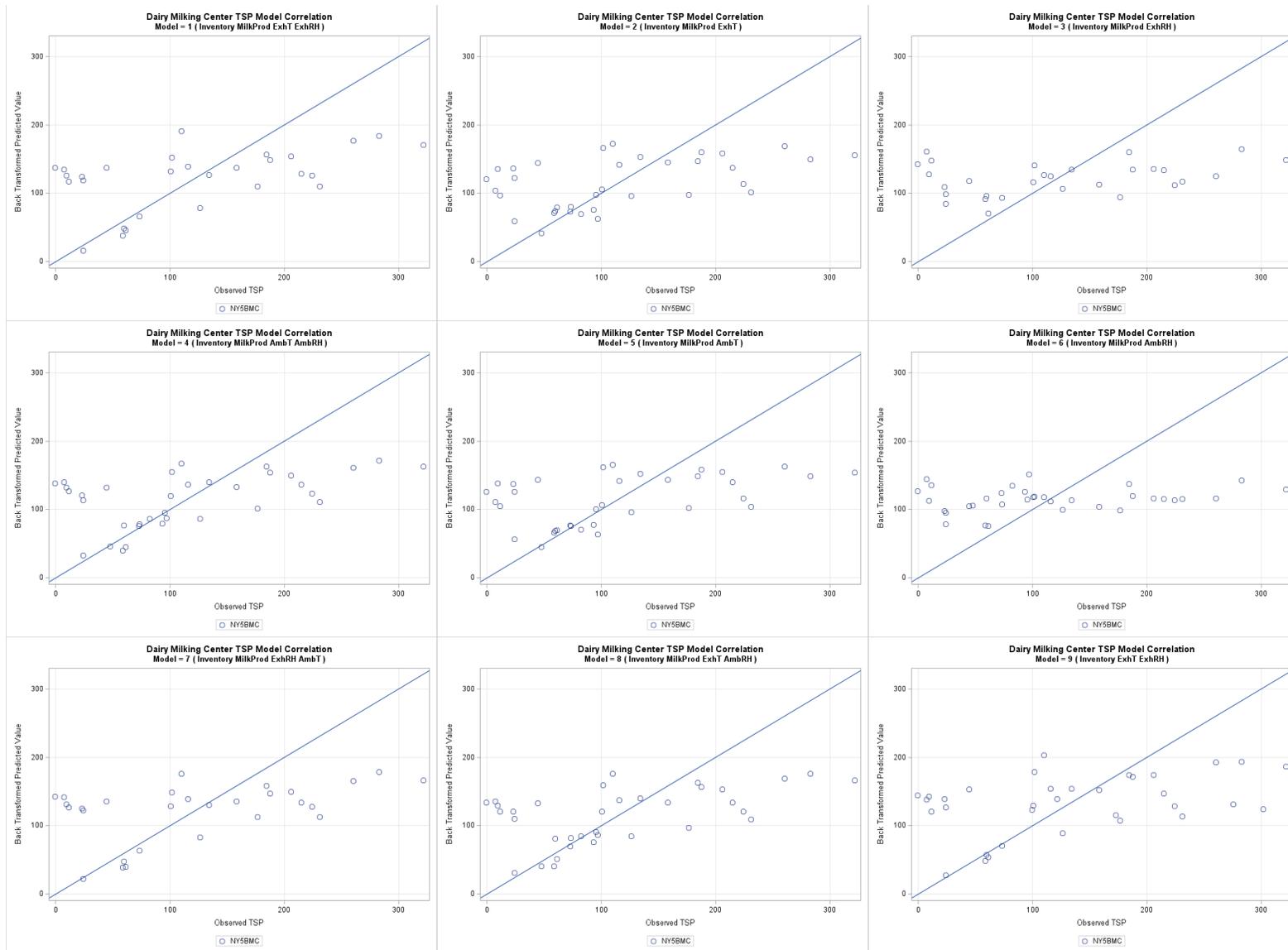


Figure G-53. Dairy milking center TSP one-to-one plots models 1 through 9, back transformed.

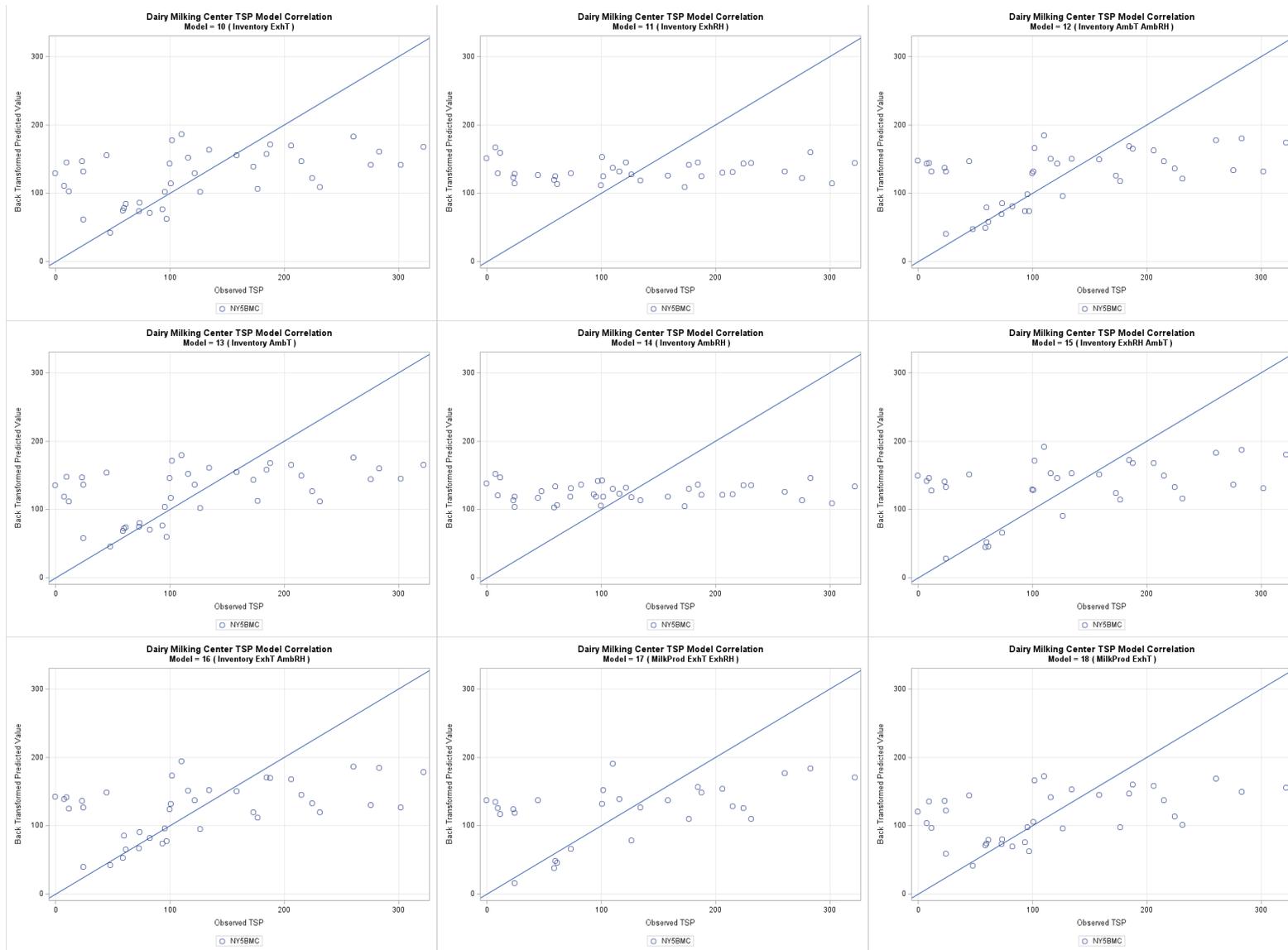


Figure G-54. Dairy milking center TSP one-to-one plots models 10 through 18, back transformed.

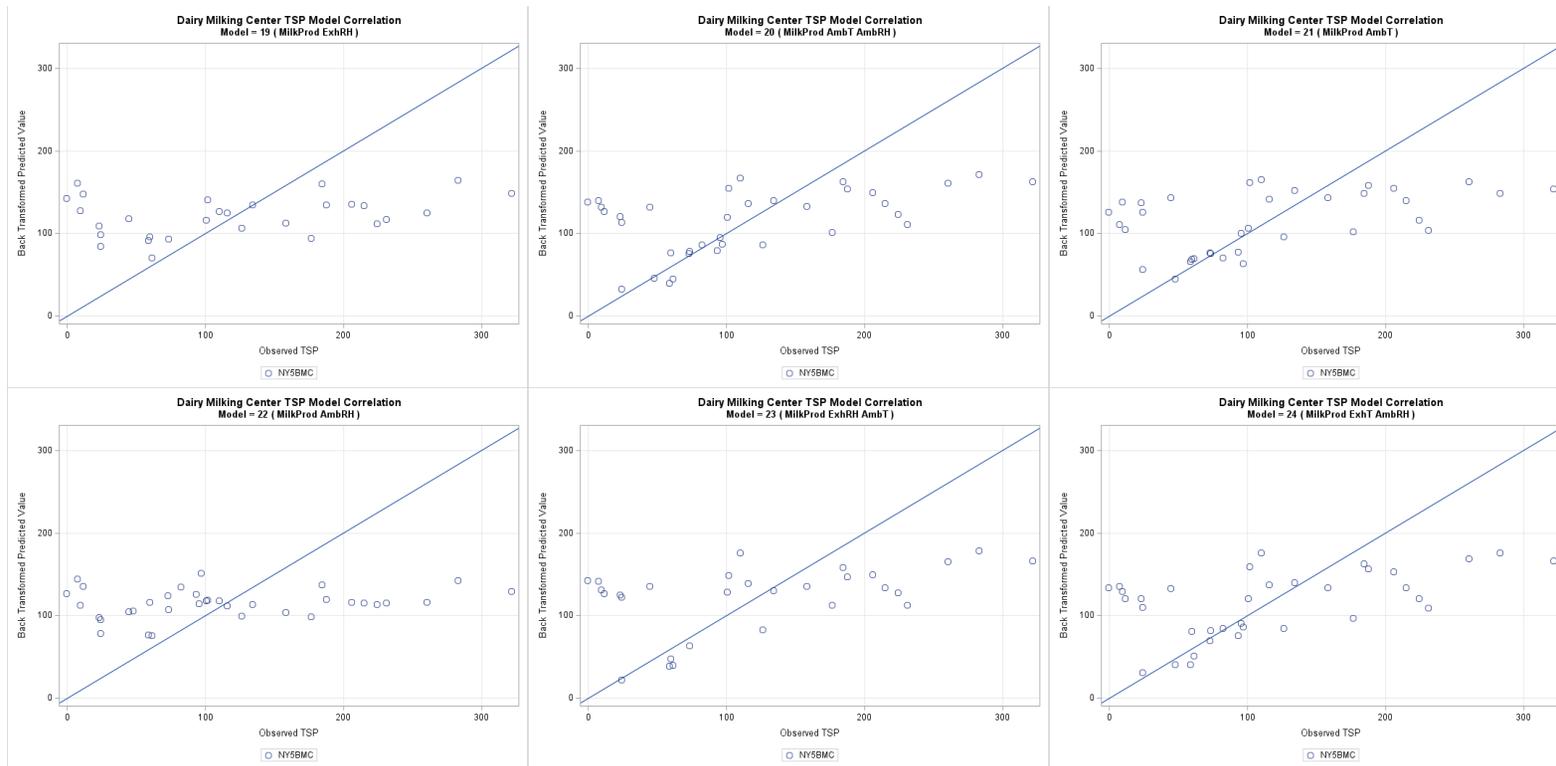


Figure G-55. Dairy milking center TSP one-to-one plots models 19 through 24, back transformed.

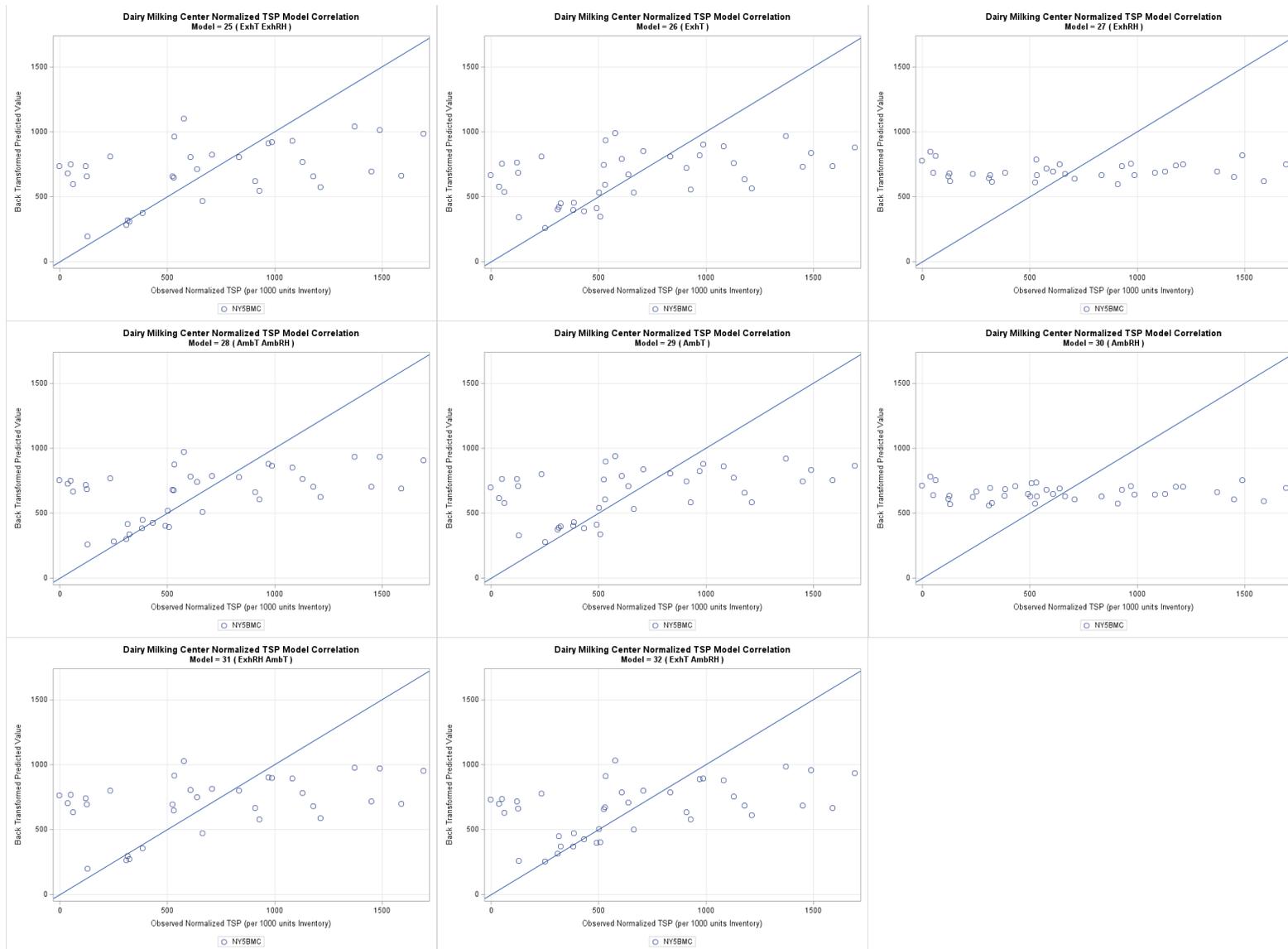


Figure G-56. Dairy milking center TSP one-to-one plots models 25 through 32, back transformed.

G.3 Naturally Ventilated Barns

Table G-23. Parameter combinations tested as naturally ventilated barns models.

Model	Parameters
NV-1	Intercept, Inventory
NV-2	Intercept, Inventory, Ambient temperature, Ambient relative humidity, Wind Speed
NV-3	Intercept, Inventory, Ambient temperature
NV-4	Intercept, Inventory, Ambient relative humidity
NV-5	Intercept, Inventory, Wind Speed
NV-6	Intercept, Inventory, Ambient temperature, Ambient relative humidity
NV-7	Intercept, Inventory, Ambient relative humidity, Wind Speed
NV-8	Intercept, Inventory Ambient temperature, Wind Speed

G.3.1 Ammonia (NH₃)

Table G-24. Parameter and estimates NH₃ emission models for dairy mechanically ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
NV-1	Intercept	0.302928	0.26899	0.2638
	Inventory	3.525901	0.41679	<.0001
NV-2	Intercept	1.564251	0.33361	<.0001
	Inventory	2.979164	0.33977	<.0001
	Ambient temperature	-0.01665	0.00637	0.0096
	Ambient relative humidity	-0.01548	0.00269	<.0001
	Wind Speed	0.046414	0.01877	<i>0.0137</i>
NV-3	Intercept	0.387363	0.29177	0.1878
	Inventory	3.492633	0.41432	<.0001
	Ambient temperature	-0.004143	0.00665	0.5341
NV-4	Intercept	1.121109	0.29364	0.0002
	Inventory	3.245651	0.36468	<.0001
	Ambient relative humidity	-0.01182	0.00261	<.0001
NV-5	Intercept	0.188357	0.2678	0.484
	Inventory	3.451939	0.4106	<.0001
	Wind Speed	0.048153	0.01837	0.009
NV-6	Intercept	1.726964	0.32917	<.0001
	Inventory	3.038111	0.34221	<.0001
	Ambient temperature	-0.019085	0.00633	0.0029
	Ambient relative humidity	-0.015666	0.00271	<.0001
NV-7	Intercept	1.02681	0.29008	0.0006
	Inventory	3.15081	0.35633	<.0001
	Ambient relative humidity	-0.012222	0.00258	<.0001
	Wind Speed	0.052342	0.01849	0.0048
NV-8	Intercept	0.238892	0.29441	0.4192
	Inventory	3.433342	0.41004	<.0001
	Ambient temperature	-0.002104	0.00665	0.7521
	Wind Speed	0.046827	0.01856	<i>0.0119</i>

Table G-25. Fit and evaluation statistics for NH₃ emission models for dairy mechanically ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (kg day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
NV-1	998	1,006	1,007	1,008	0.601	27.52	76.2	12.98	0.969	5.686
NV-2	964	978	978	981	0.719	24.21	62.92	10.76	-0.583	-3.41
NV-3	995	1,005	1,005	1,007	0.609	27.2	74.93	12.81	0.824	4.821
NV-4	978	988	988	990	0.671	25.61	68.15	11.65	0.019	0.113
NV-5	992	1,002	1,002	1,004	0.615	27.08	75.23	12.82	0.828	4.862
NV-6	970	982	982	984	0.715	24.36	63.4	10.84	-0.491	-2.87
NV-7	970	982	982	985	0.686	25.18	66.73	11.41	-0.21	-1.23
NV-8	988	1,000	1,001	1,003	0.618	26.92	74.61	12.75	0.765	4.476

^a Based on transformed data (i.e., ln(NH₃)).

^b Based on back-transformed data.

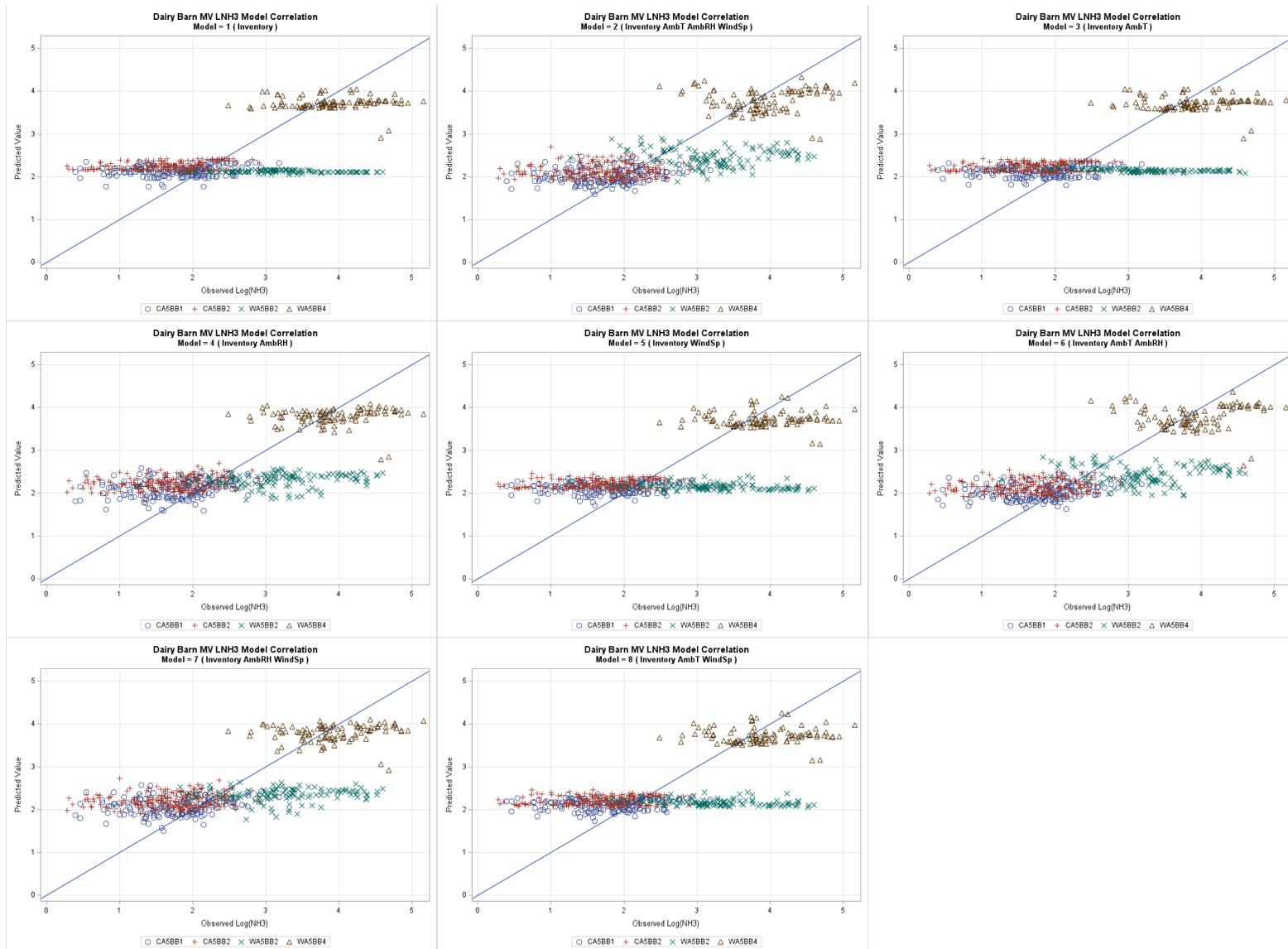


Figure G-57. Dairy naturally ventilated barn NH₃ one-to-one plots models 1 through 8, log transformed.

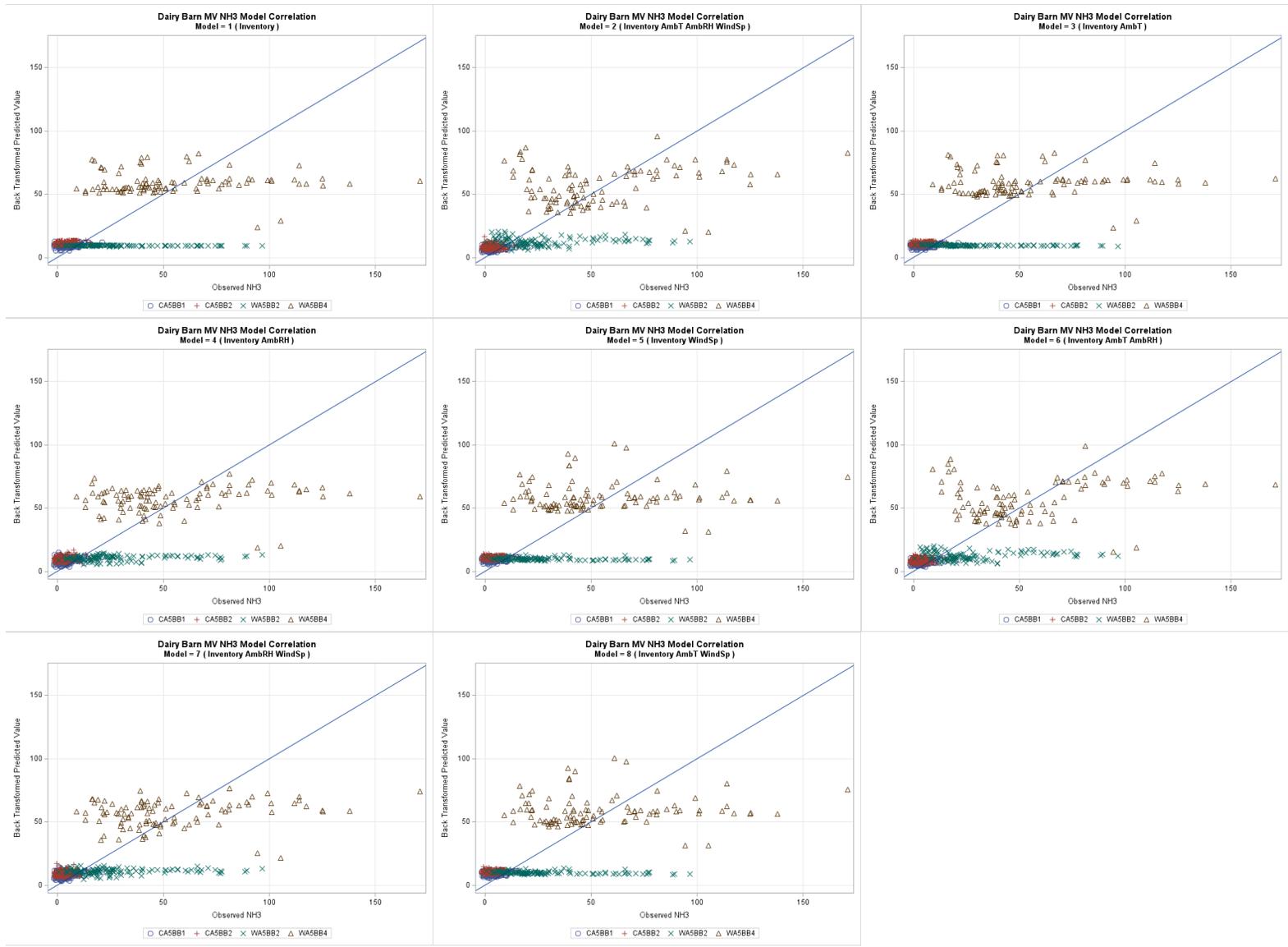


Figure G-58. Dairy naturally ventilated barn NH₃ one-to-one plots models 1 through 8, back transformed.

G.3.2 Hydrogen Sulfide (H₂S)

Table G-26. Parameter and estimates H₂S emission models for dairy naturally ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
NV-1	Intercept	6.68466	0.1356	<.0001
	Inventory	0.67609	0.21735	0.0022
NV-2	Intercept	6.675321	0.26174	<.0001
	Inventory	0.54958	0.23161	<i>0.0186</i>
	Ambient temperature	-0.003921	0.00477	0.4118
	Ambient relative humidity	-0.000765	0.00225	0.734
	Wind Speed	0.059704	0.02329	<i>0.0106</i>
NV-3	Intercept	6.824733	0.15921	<.0001
	Inventory	0.633119	0.21924	0.0043
	Ambient temperature	-0.007224	0.00424	0.0895
NV-4	Intercept	6.663477	0.20081	<.0001
	Inventory	0.686017	0.22535	0.0027
	Ambient relative humidity	0.000289	0.00212	0.8919
NV-5	Intercept	6.541057	0.14434	<.0001
	Inventory	0.587702	0.21921	0.008
	Wind Speed	0.062678	0.02193	0.0044
NV-6	Intercept	6.911144	0.24515	<.0001
	Inventory	0.599883	0.23054	<i>0.01</i>
	Ambient temperature	-0.007924	0.0045	0.0794
	Ambient relative humidity	-0.001042	0.00225	0.6435
NV-7	Intercept	6.541762	0.20441	<.0001
	Inventory	0.581809	0.22794	<i>0.0114</i>
	Ambient relative humidity	-0.000151	0.00212	0.9432
	Wind Speed	0.065974	0.02198	0.0028
NV-8	Intercept	6.610517	0.17959	<.0001
	Inventory	0.573546	0.2207	<i>0.0101</i>
	Ambient temperature	-0.003381	0.0045	0.453
	Wind Speed	0.060086	0.02327	<i>0.01</i>

Table G-27. Fit and evaluation statistics for H₂S emission models for dairy naturally ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
NV-1	1182	1190	1190	1192	0.143	6.468	78.57	690.4	-22.89	-2.605
NV-2	1156	1170	1171	1173	0.185	6.477	76.7	675.5	-31.35	-3.56
NV-3	1163	1173	1173	1175	0.158	6.517	77.5	682.5	-27.48	-3.12
NV-4	1166	1176	1176	1178	0.143	6.43	78.11	687.9	-22.82	-2.591
NV-5	1174	1184	1184	1186	0.182	6.461	77.09	677.5	-29.02	-3.302
NV-6	1163	1175	1175	1177	0.16	6.525	77.45	682.1	-28.85	-3.276
NV-7	1157	1169	1169	1171	0.183	6.427	76.57	674.3	-29.47	-3.346
NV-8	1157	1169	1169	1171	0.184	6.474	76.72	675.7	-30.34	-3.445

^a Based on transformed data (i.e., ln(H₂S)).

^b Based on back-transformed data.

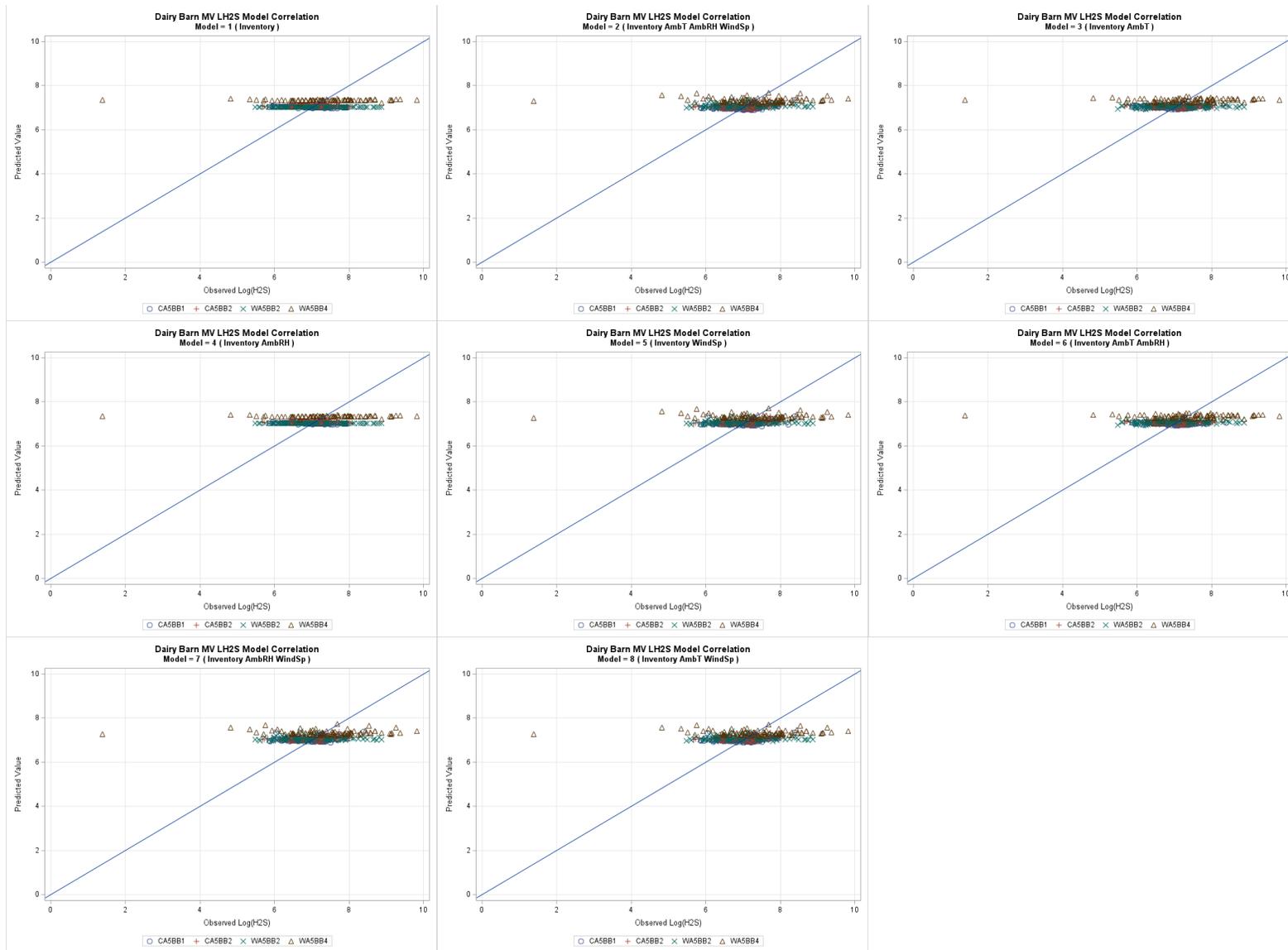


Figure G-59. Dairy naturally ventilated barn H₂S one-to-one plots models 1 through 8, log transformed.

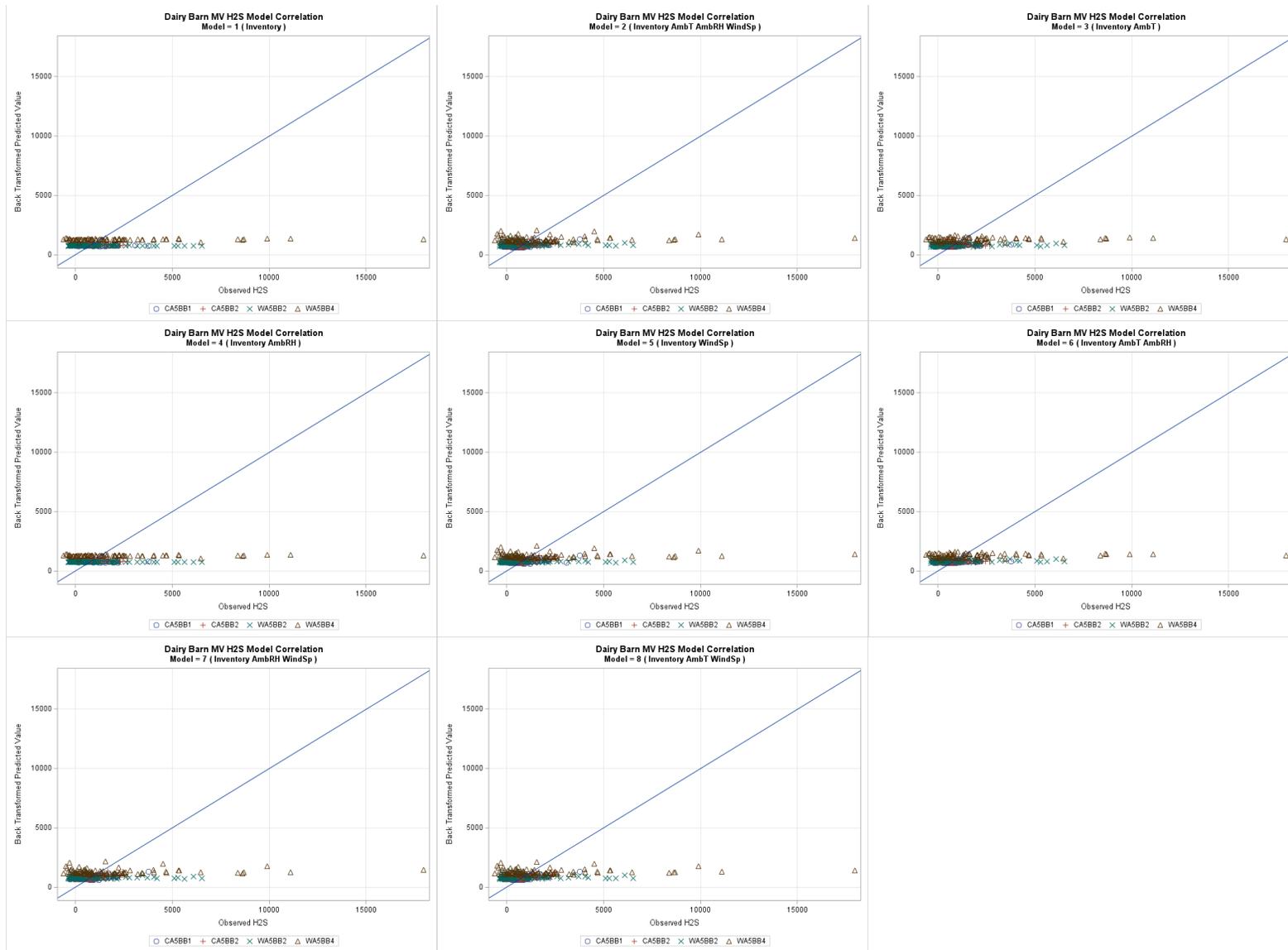


Figure G-60. Dairy naturally ventilated barn H₂S one-to-one plots models 1 through 8, back transformed.

G.3.3 PM₁₀

Table G-28. Parameter and estimates PM₁₀ emission models for dairy naturally ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
NV-1	Intercept	7.009063	0.13722	<.0001
	Inventory	2.082987	0.20542	<.0001
NV-2	Intercept	7.64258	0.16783	<.0001
	Inventory	1.525009	0.14917	<.0001
	Ambient temperature	0.011864	0.00333	0.0004
	Ambient relative humidity	-0.01521	0.00154	<.0001
	Wind Speed	0.173698	0.01064	<.0001
NV-3	Intercept	6.65764	0.14302	<.0001
	Inventory	2.180088	0.19022	<.0001
	Ambient temperature	0.022242	0.00401	<.0001
NV-4	Intercept	8.55389	0.14514	<.0001
	Inventory	1.471936	0.1528	<.0001
	Ambient relative humidity	-0.021771	0.00153	<.0001
NV-5	Intercept	6.731818	0.12658	<.0001
	Inventory	1.87902	0.18847	<.0001
	Wind Speed	0.189893	0.01051	<.0001
NV-6	Intercept	8.30515	0.16936	<.0001
	Inventory	1.553859	0.15268	<.0001
	Ambient temperature	0.00977	0.00345	0.0049
	Ambient relative humidity	-0.020486	0.00159	<.0001
NV-7	Intercept	7.94231	0.14612	<.0001
	Inventory	1.430049	0.15197	<.0001
	Ambient relative humidity	-0.016713	0.00149	<.0001
	Wind Speed	0.172251	0.01063	<.0001
NV-8	Intercept	6.399407	0.12982	<.0001
	Inventory	1.970209	0.17197	<.0001
	Ambient temperature	0.02085	0.00363	<.0001
	Wind Speed	0.190344	0.01057	<.0001

Table G-29. Fit and evaluation statistics for PM₁₀ emission models for dairy naturally ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
NV-1	2520	2528	2528	2529	0.455	6.512	106.8	5382	-189.6	-3.764
NV-2	2103	2117	2117	2120	0.707	4.896	82.58	4196	-668.8	-13.16
NV-3	2480	2490	2490	2492	0.512	6.325	100	5082	-293.4	-5.775
NV-4	2354	2364	2364	2366	0.645	5.427	90.28	4588	-633.1	-12.46
NV-5	2225	2235	2235	2237	0.59	5.713	96.61	4867	-350.2	-6.951
NV-6	2346	2358	2358	2361	0.654	5.374	88.54	4499	-648.2	-12.76
NV-7	2115	2127	2127	2129	0.693	4.995	85.47	4343	-623.2	-12.26
NV-8	2187	2199	2199	2201	0.637	5.52	89.53	4550	-487.1	-9.586

^a Based on transformed data (i.e., ln(PM₁₀)).

^b Based on back-transformed data.

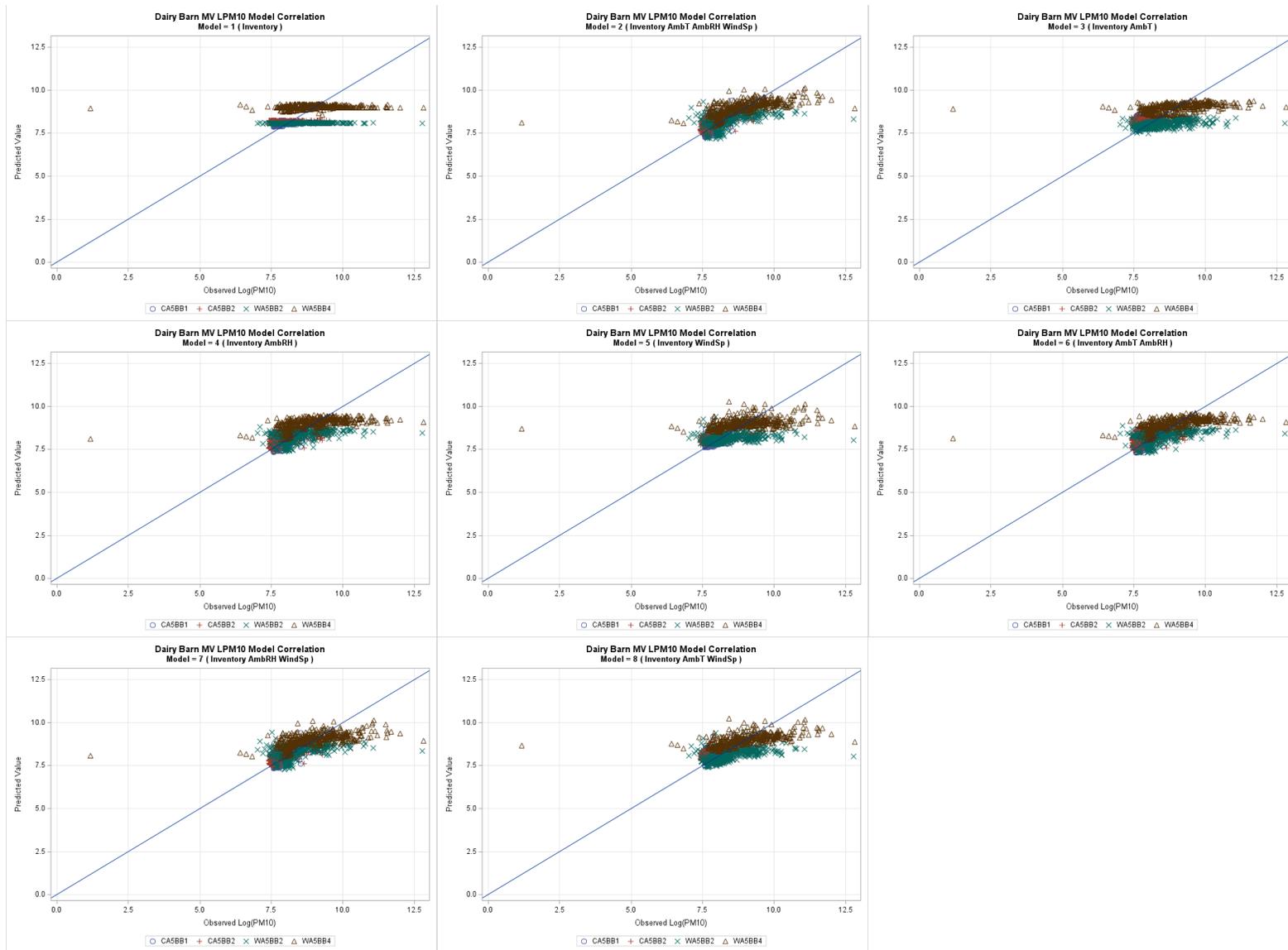


Figure G-61. Dairy naturally ventilated barn PM₁₀ one-to-one plots models 1 through 8, log transformed.

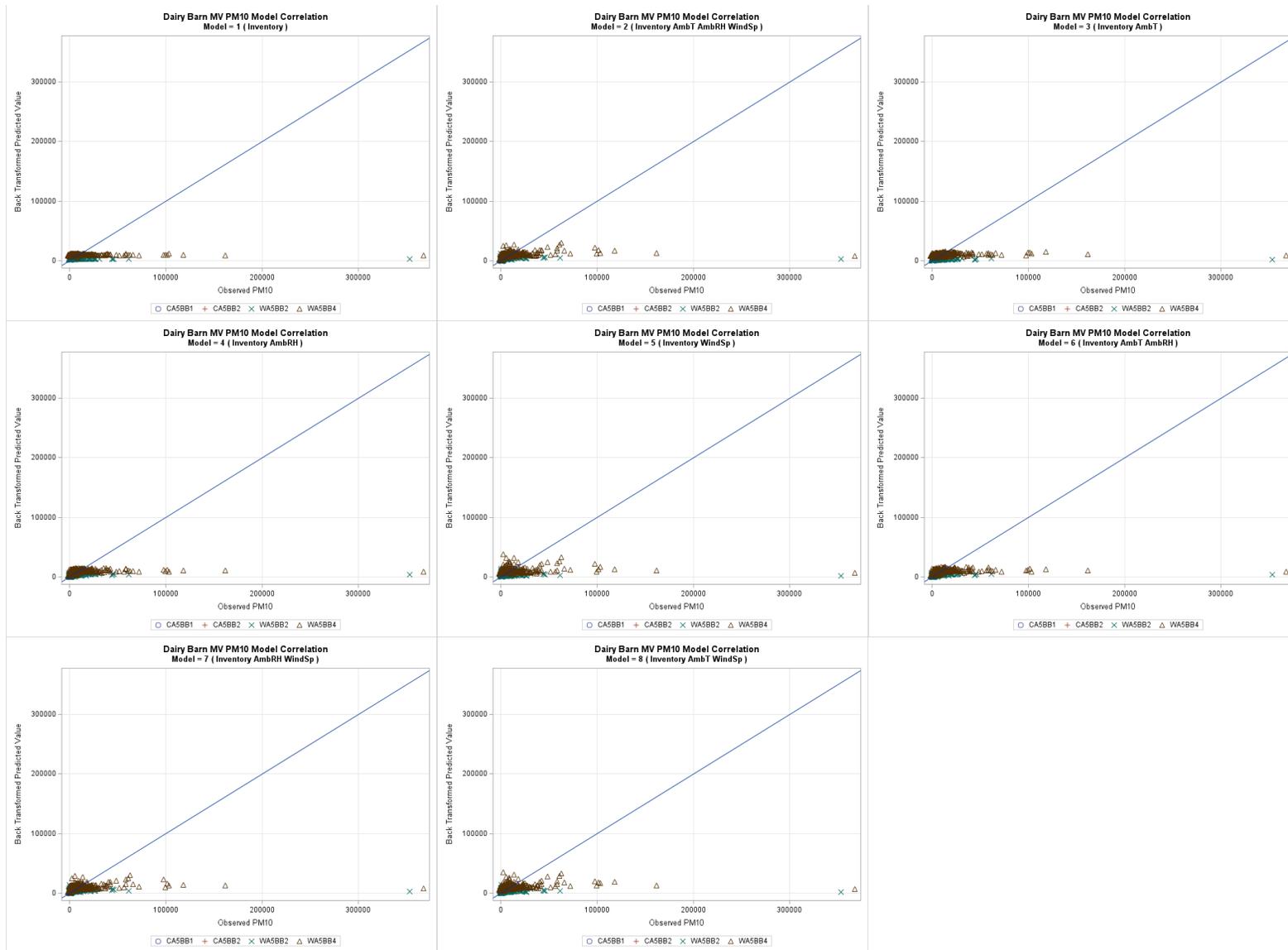


Figure G-62. Dairy naturally ventilated barn PM₁₀ one-to-one plots models 1 through 8, back transformed.

G.3.4 Fine particulate matter (PM_{2.5})

Table G-30. Parameter and estimates PM_{2.5} emission models for dairy naturally ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
NV-1	Intercept	7.538178	0.60541	<.0001
	Inventory	-0.062898	0.82412	0.9401
NV-2	Intercept	7.068797	1.15954	<.0001
	Inventory	-0.220453	0.75959	0.7753
	Ambient temperature	0.01121	0.02585	0.6681
	Ambient relative humidity	-0.003808	0.01023	0.7125
	Wind Speed	0.218968	0.0563	0.0002
NV-3	Intercept	7.191914	0.67544	<.0001
	Inventory	-0.048643	0.8011	0.9523
	Ambient temperature	0.020077	0.01867	0.2929
NV-4	Intercept	8.102164	0.75989	<.0001
	Inventory	-0.210004	0.83321	0.8043
	Ambient relative humidity	-0.009286	0.00755	0.2293
NV-5	Intercept	7.017716	0.57907	<.0001
	Inventory	-0.162197	0.76824	0.8354
	Wind Speed	0.22186	0.05644	0.0002
NV-6	Intercept	7.884815	1.26347	<.0001
	Inventory	-0.175865	0.84208	0.8374
	Ambient temperature	0.006056	0.02852	0.8336
	Ambient relative humidity	-0.007434	0.01126	0.5147
NV-7	Intercept	7.468014	0.70982	<.0001
	Inventory	-0.2821	0.75884	0.7147
	Ambient relative humidity	-0.007141	0.0069	0.3095
	Wind Speed	0.217628	0.05624	0.0002
NV-8	Intercept	6.707074	0.63045	<.0001
	Inventory	-0.153913	0.73284	0.8362
	Ambient temperature	0.018488	0.01708	0.2895
	Wind Speed	0.22074	0.05621	0.0002

Table G-31. Fit and evaluation statistics for PM_{2.5} emission models for dairy naturally ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
NV-1	213	221	221	223	0.115	9.415	83.02	1547	-1.112	-0.06
NV-2	197	211	212	214	0.405	8.789	62.65	1167	-19.48	-1.046
NV-3	212	222	222	224	0.185	9.218	73.49	1369	-4.909	-0.264
NV-4	211	221	222	223	0.075	9.331	77.47	1443	33.14	1.779
NV-5	198	208	209	210	0.383	8.499	68.51	1276	32.93	1.768
NV-6	211	223	224	226	0.106	9.295	75.78	1412	25.66	1.378
NV-7	197	209	210	212	0.376	8.814	64.72	1206	-3.53	-0.189
NV-8	197	209	210	212	0.425	8.719	61.74	1150	-23.56	-1.265

^a Based on transformed data (i.e., ln(PM_{2.5})).

^b Based on back-transformed data.

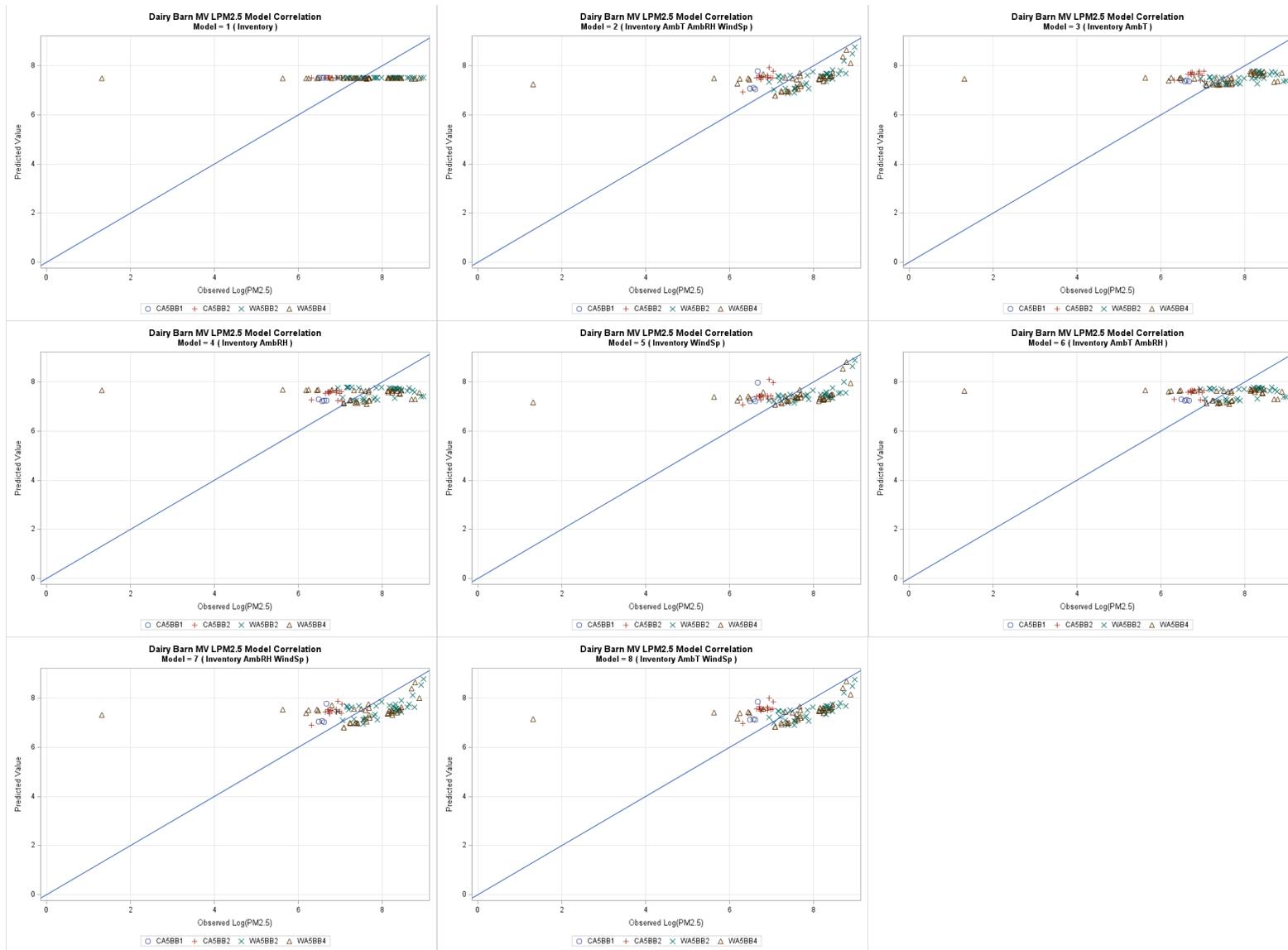


Figure G-63. Dairy naturally ventilated barn PM_{2.5} one-to-one plots models 1 through 8, log transformed.

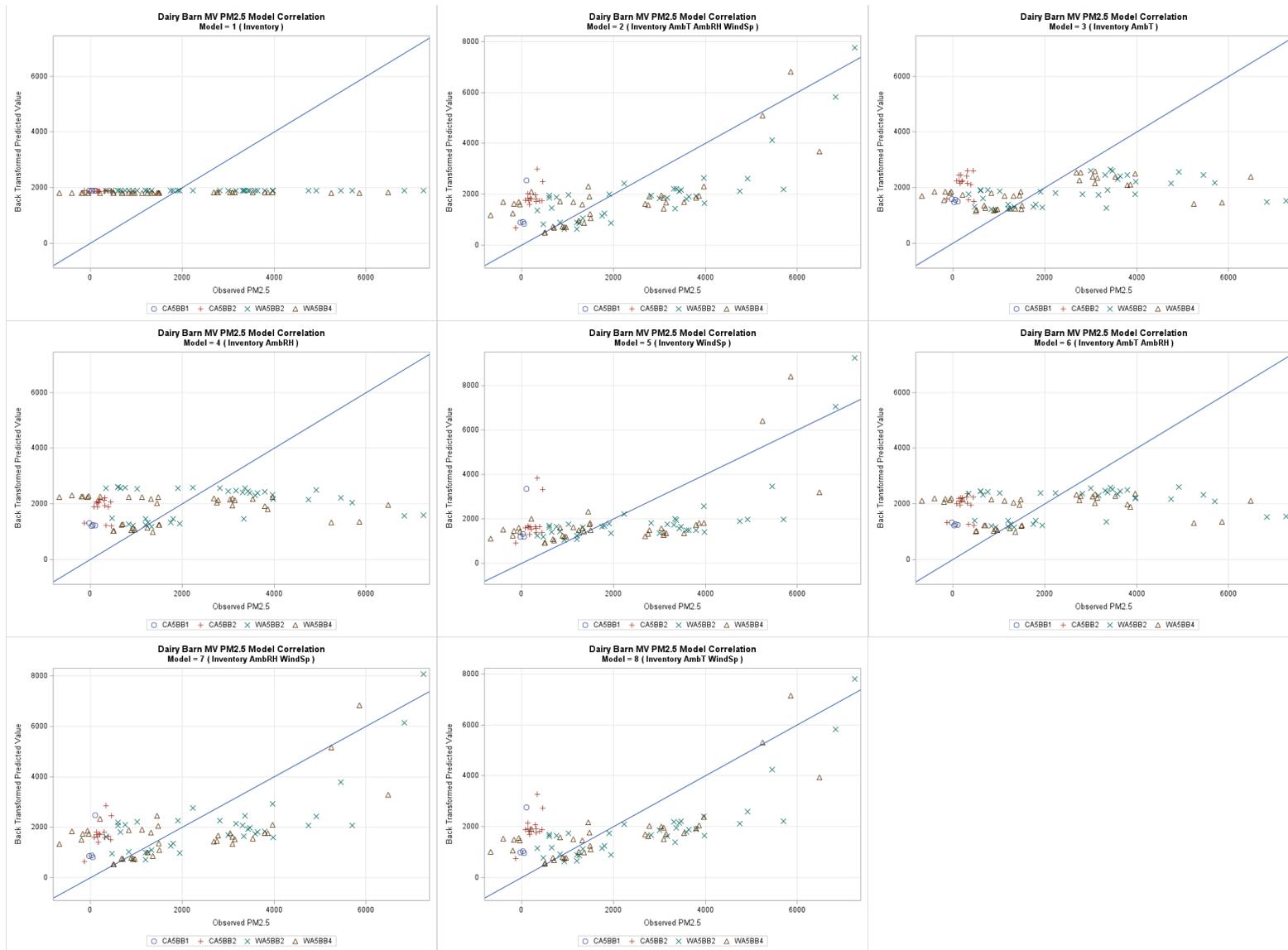


Figure G-64. Dairy naturally ventilated barn PM_{2.5} one-to-one plots models 1 through 8, back transformed.

G.3.5 Total Suspended Particulates (TSP)

Table G-32. Parameter and estimates TSP emission models for dairy naturally ventilated barn.

Model	Parameter	Estimate	Standard Error	p-value
NV-1	Intercept	6.716276	0.54312	<.0001
	Inventory	3.65659	0.8364	<.0001
NV-2	Intercept	7.868847	0.58294	<.0001
	Inventory	2.953893	0.48928	<.0001
	Ambient temperature	0.034508	0.01069	0.0021
	Ambient relative humidity	-0.033997	0.00508	<.0001
	Wind Speed	0.248191	0.04211	<.0001
NV-3	Intercept	5.452192	0.49718	<.0001
	Inventory	4.164233	0.6622	<.0001
	Ambient temperature	0.063139	0.01381	<.0001
NV-4	Intercept	9.787872	0.4929	<.0001
	Inventory	2.537642	0.53949	<.0001
	Ambient relative humidity	-0.04473	0.00513	<.0001
NV-5	Intercept	6.174486	0.51843	<.0001
	Inventory	3.474803	0.78627	<.0001
	Wind Speed	0.280443	0.04518	<.0001
NV-6	Intercept	8.765746	0.59397	<.0001
	Inventory	2.928583	0.51502	<.0001
	Ambient temperature	0.030747	0.01123	0.0083
	Ambient relative humidity	-0.038657	0.00531	<.0001
NV-7	Intercept	9.015472	0.4949	<.0001
	Inventory	2.516121	0.5246	<.0001
	Ambient relative humidity	-0.040582	0.00498	<.0001
	Wind Speed	0.242434	0.04269	<.0001
NV-8	Intercept	4.87915	0.4634	<.0001
	Inventory	4.001109	0.60616	<.0001
	Ambient temperature	0.063391	0.01263	<.0001
	Wind Speed	0.288347	0.04483	<.0001

Table G-33. Fit and evaluation statistics for TSP emission models for dairy naturally ventilated barn.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (g day ⁻¹)	MB ^b (g day ⁻¹)	NMB ^b (%)
NV-1	555	563	563	564	0.473	10.32	95.26	15590	731.5	4.469
NV-2	465	479	480	482	0.799	6.07	52.78	8640	-492.6	-3.009
NV-3	540	550	550	552	0.649	8.187	79.69	13040	1027	6.277
NV-4	504	514	514	516	0.738	7.035	77.22	12640	724.9	4.428
NV-5	519	529	530	531	0.562	9.458	74.7	12230	-481.8	-2.943
NV-6	498	510	510	512	0.765	6.577	70.74	11580	1087	6.638
NV-7	474	486	486	488	0.769	6.741	63.73	10430	-732.5	-4.475
NV-8	502	514	514	516	0.712	7.348	53.6	8773	-517.8	-3.164

^a Based on transformed data (i.e., ln(TSP)).

^b Based on back-transformed data.

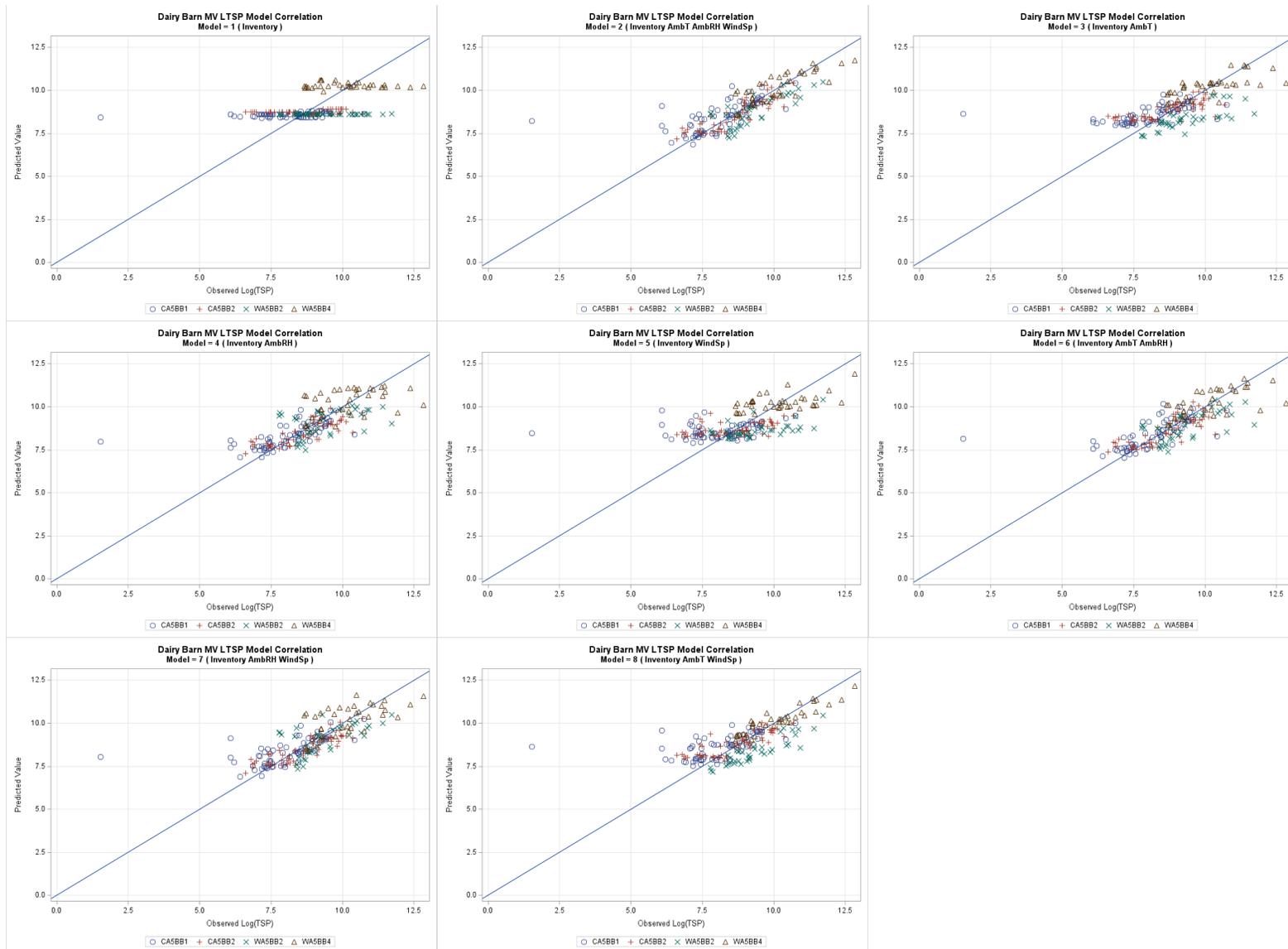


Figure G-65. Dairy naturally ventilated barn TSP one-to-one plots models 1 through 8, log transformed.

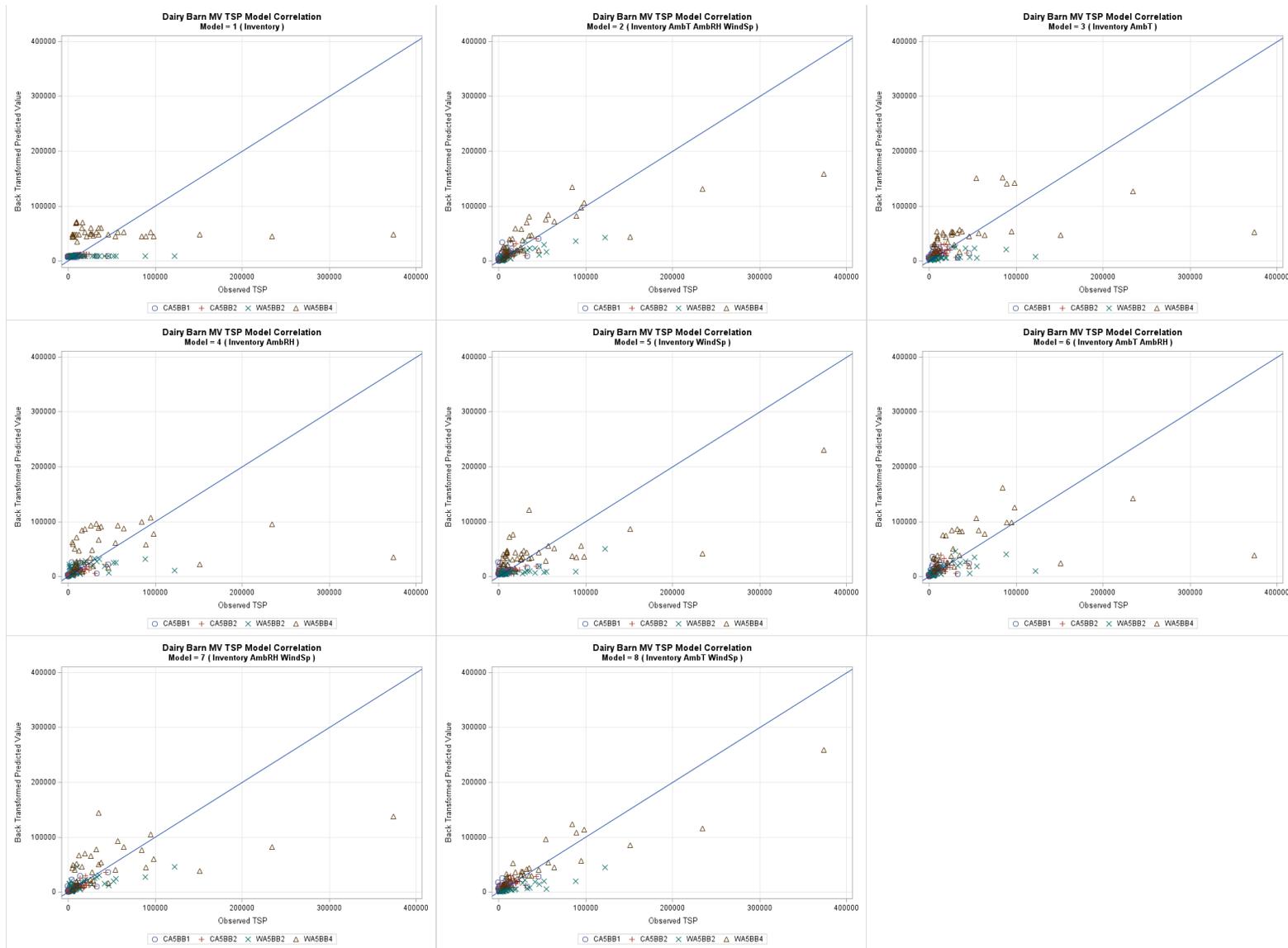


Figure G-66. Dairy naturally ventilated barn TSP one-to-one plots models 1 through 8, back transformed.

G.4 Lagoons

G.4.1 Ammonia (NH₃)

Table G-34. Parameter and estimates NH₃ emission models for dairy lagoons.

Model	Parameter	Estimate	Standard Error	p-value
1	Intercept	1.722568	0.6531	0.0199
	pH	-0.053724	0.08502	0.5378
	Lagoon temperature	0.027232	0.00574	0.0005
2	Intercept	2.591012	1.01478	0.0295
	pH	-0.102478	0.13732	0.473
3	Intercept	1.314921	0.11852	<.0001
	Lagoon temperature	0.027883	0.00579	0.0004
4	Intercept	1.371991	0.0478	<.0001
	Ambient temperature	0.027336	0.00196	<.0001
	Wind speed	0.007476	0.01235	0.546
5	Intercept	1.396734	0.0248	<.0001
	Ambient temperature	0.027201	0.00195	<.0001
6	Intercept	1.502677	0.09895	<.0001
	Wind speed	0.023567	0.01151	0.0426
7	Intercept	1.608092	0.43955	0.0048
	pH	-0.055494	0.0508	0.305
	Lagoon temperature	0.003169	0.0121	0.7953
	Ambient temperature	0.025656	0.00858	0.0055
	Wind speed	0.087207	0.04508	0.0613
8	Intercept	1.932937	0.34647	<.0001
	pH	-0.045789	0.04532	0.3291
	Lagoon temperature	-0.014509	0.00847	0.1031
	Ambient temperature	0.035315	0.00719	<.0001
9	Intercept	1.163616	0.61297	0.0794
	pH	-0.046984	0.07586	0.547
	Lagoon temperature	0.037778	0.00618	<.0001
	Wind speed	0.130956	0.04347	0.005
10	Intercept	1.653065	0.39038	0.0011
	pH	-0.054928	0.05035	0.2967
	Ambient temperature	0.027696	0.0032	<.0001
	Wind speed	0.07906	0.03441	0.0295
11	Intercept	1.169318	0.22158	<.0001
	Lagoon temperature	0.00492	0.01259	0.6987
	Ambient temperature	0.024875	0.00893	0.0092
	Wind speed	0.090877	0.04651	0.0591
12	Intercept	1.852817	0.3957	0.0006
	pH	-0.049413	0.05252	0.3659
	Ambient temperature	0.023893	0.00288	<.0001
13	Intercept	2.318938	1.30318	0.1328
	pH	-0.098184	0.17512	0.598
	Wind speed	0.093085	0.04437	0.0451
14	Intercept	1.590048	0.07475	<.0001
	Lagoon temperature	-0.014419	0.00859	0.1094
	Ambient temperature	0.035571	0.00728	<.0001
15	Intercept	0.804363	0.19861	0.0003
	Lagoon temperature	0.038432	0.00622	<.0001
	Wind speed	0.131343	0.0434	0.0048

Table G-35. Fit and evaluation statistics for NH₃ emission models for dairy lagoons.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (kg day ⁻¹ m ⁻²)	MB ^b (kg day ⁻¹ m ⁻²)	NMB ^b (%)
1	-18	-8	-6	-14	0.708	8.598	31	1.09	0.01	0.275
2	-4	4	5	-1	0.195	11.94	39.73	1.397	-0.006	-0.164
3	-17	-9	-8	-14	0.701	8.806	31.62	1.112	0.01	0.295
4	-84	-74	-73	-78	0.845	9.664	38.59	0.708	-0.036	-1.947
5	-83	-75	-75	-79	0.844	9.709	38.77	0.712	-0.034	-1.859
6	-26	-18	-17	-21	-0.21	20.38	79.01	1.531	0.017	0.901
7	-33	-19	-15	-28	0.837	6.727	23.31	0.819	-0.01	-0.291
8	-30	-18	-15	-25	0.811	7.504	26.16	0.92	-0.001	-0.035
9	-27	-15	-12	-22	0.783	7.857	27.49	0.966	0.005	0.133
10	-33	-21	-18	-28	0.837	6.772	23.42	0.823	-0.01	-0.284
11	-32	20	17	27	-0.83	6.828	23.86	0.839	-0.012	-0.341
12	-27	-17	-15	-24	0.805	7.521	26.6	0.935	-0.01	-0.285
13	-7	3	5	-4	-0.08	13.16	43.55	1.531	0.052	1.472
14	-29	-19	-17	-25	0.805	7.781	26.94	0.947	-0.002	-0.044
15	-26	-16	-14	-23	0.777	7.921	27.62	0.971	0.006	0.165

^a Based on transformed data (i.e., ln(NH₃)).

^b Based on back-transformed data.

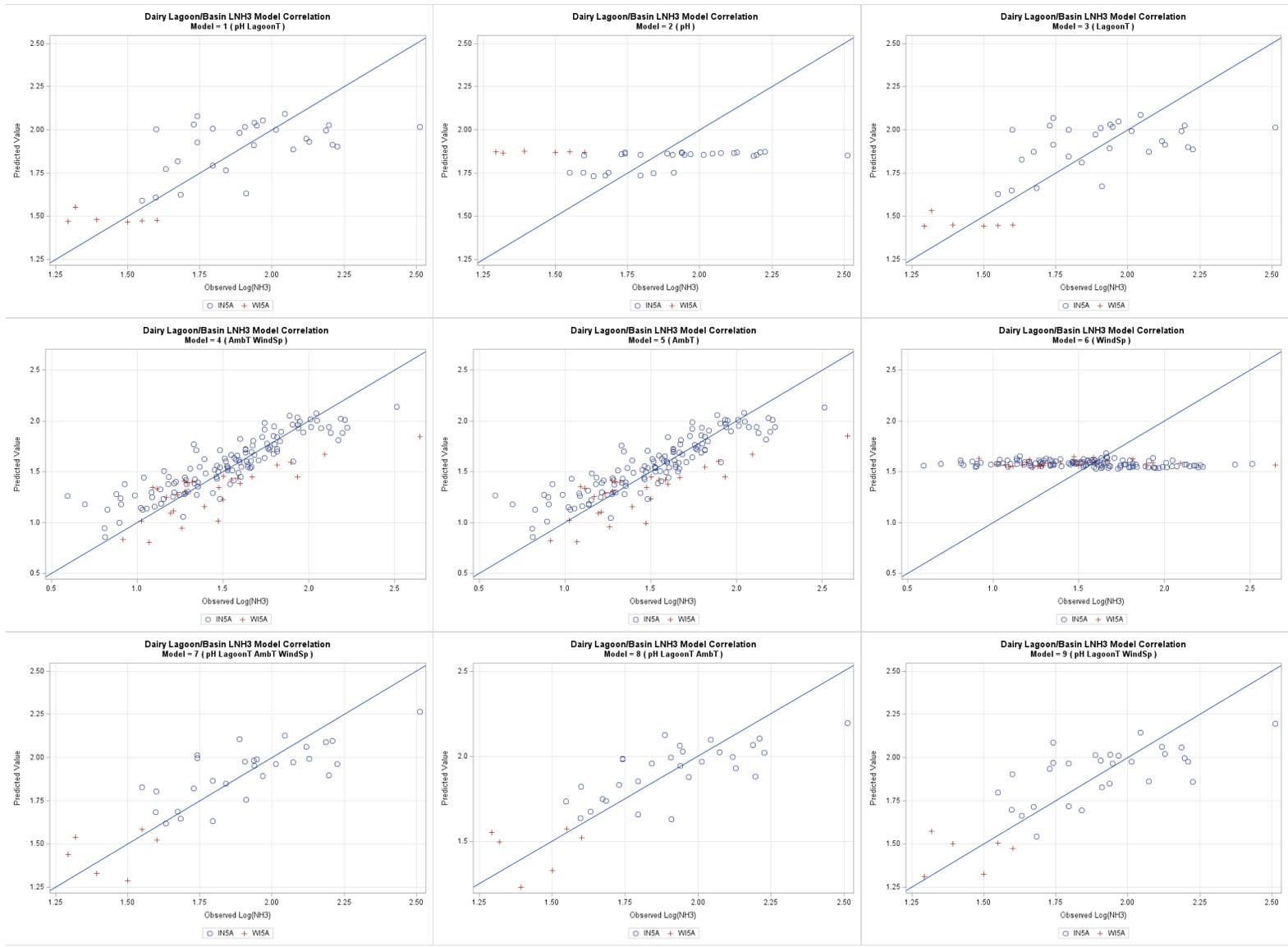


Figure G-67. Dairy lagoon NH₃ one-to-one plots models 1 through 9, log transformed.

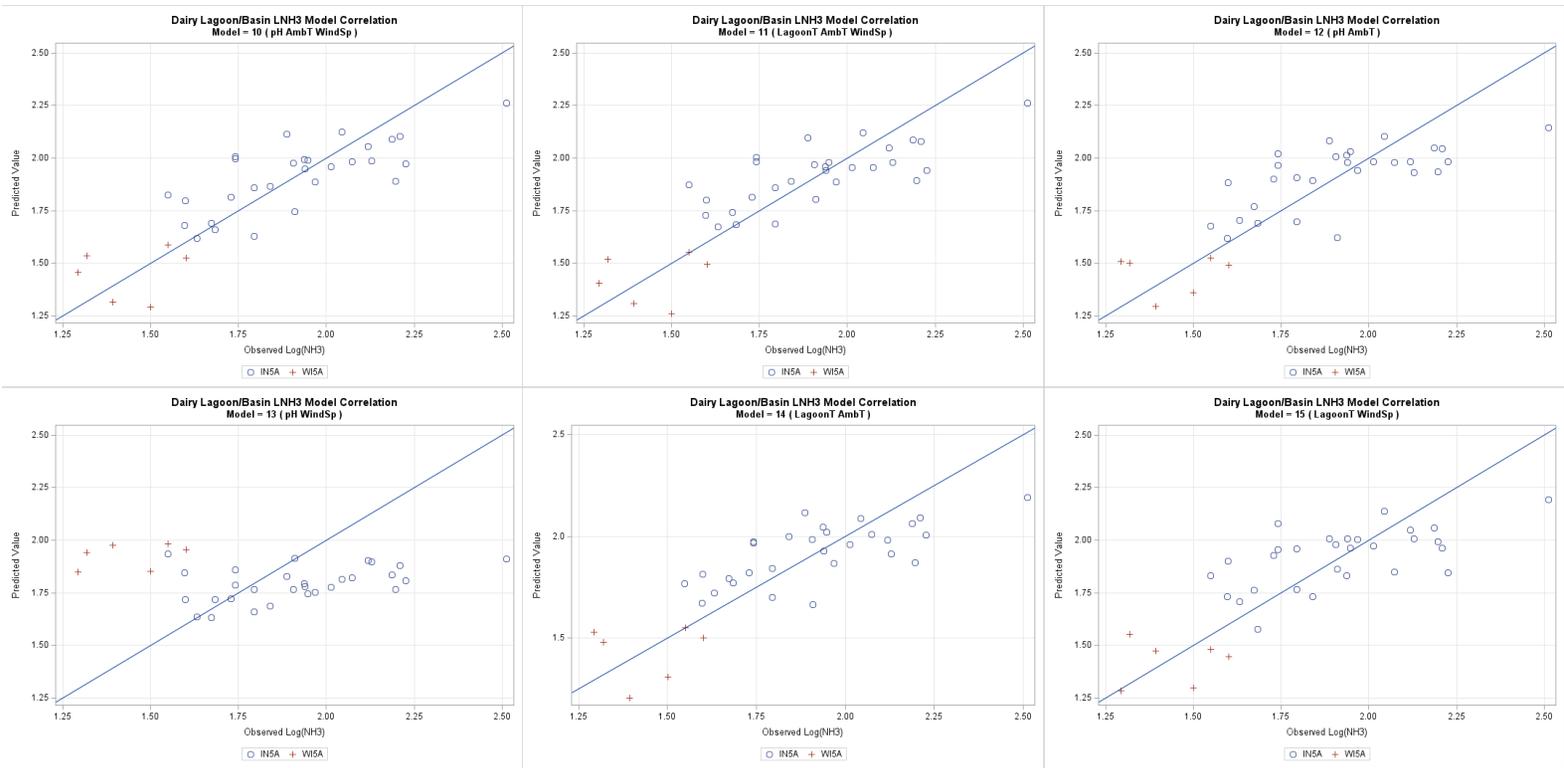


Figure G-68. Dairy lagoon NH₃ one-to-one plots models 10 through 15, log transformed.

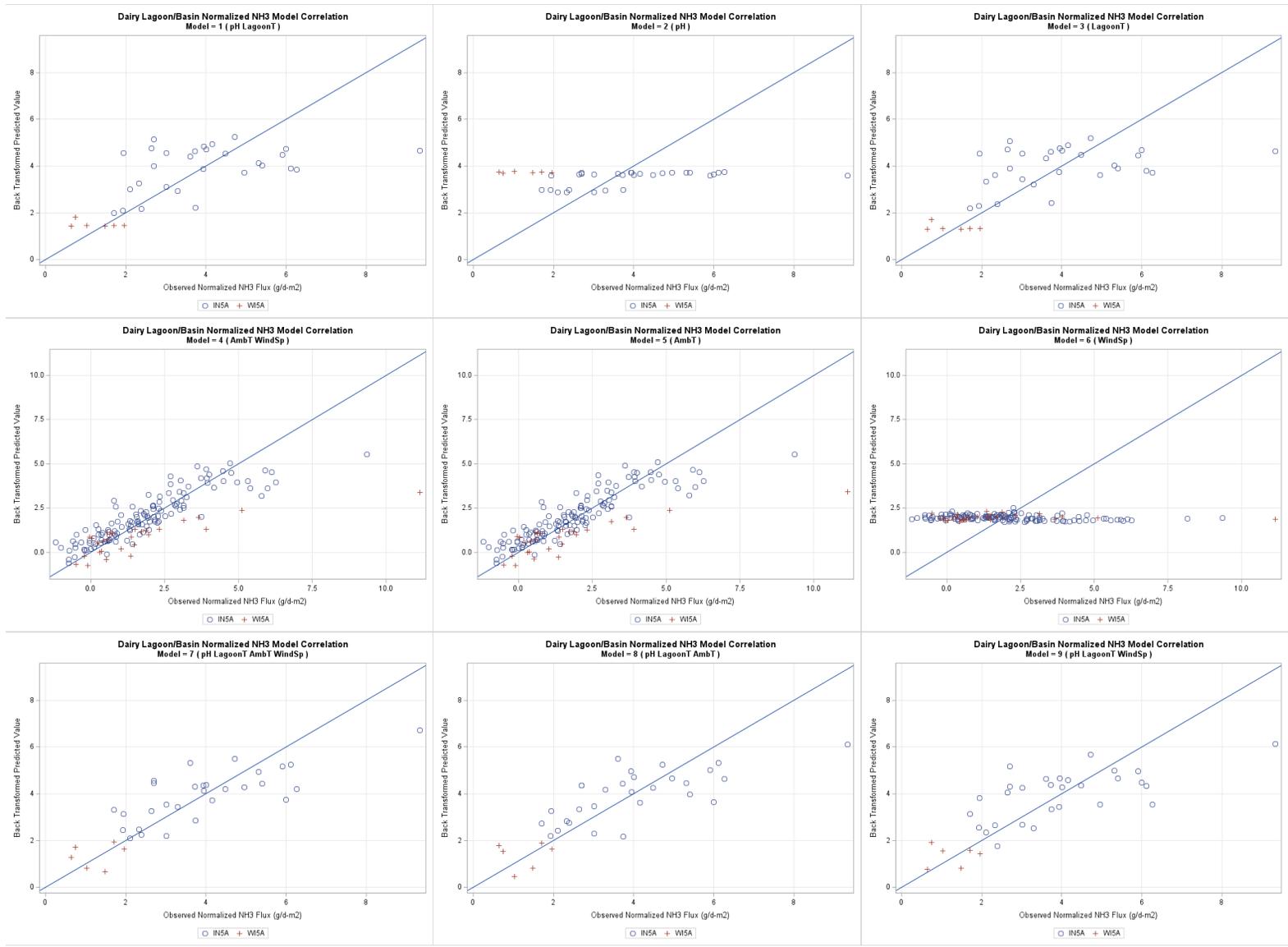


Figure G-69. Dairy lagoon NH₃ one-to-one plots models 1 through 9, back transformed.

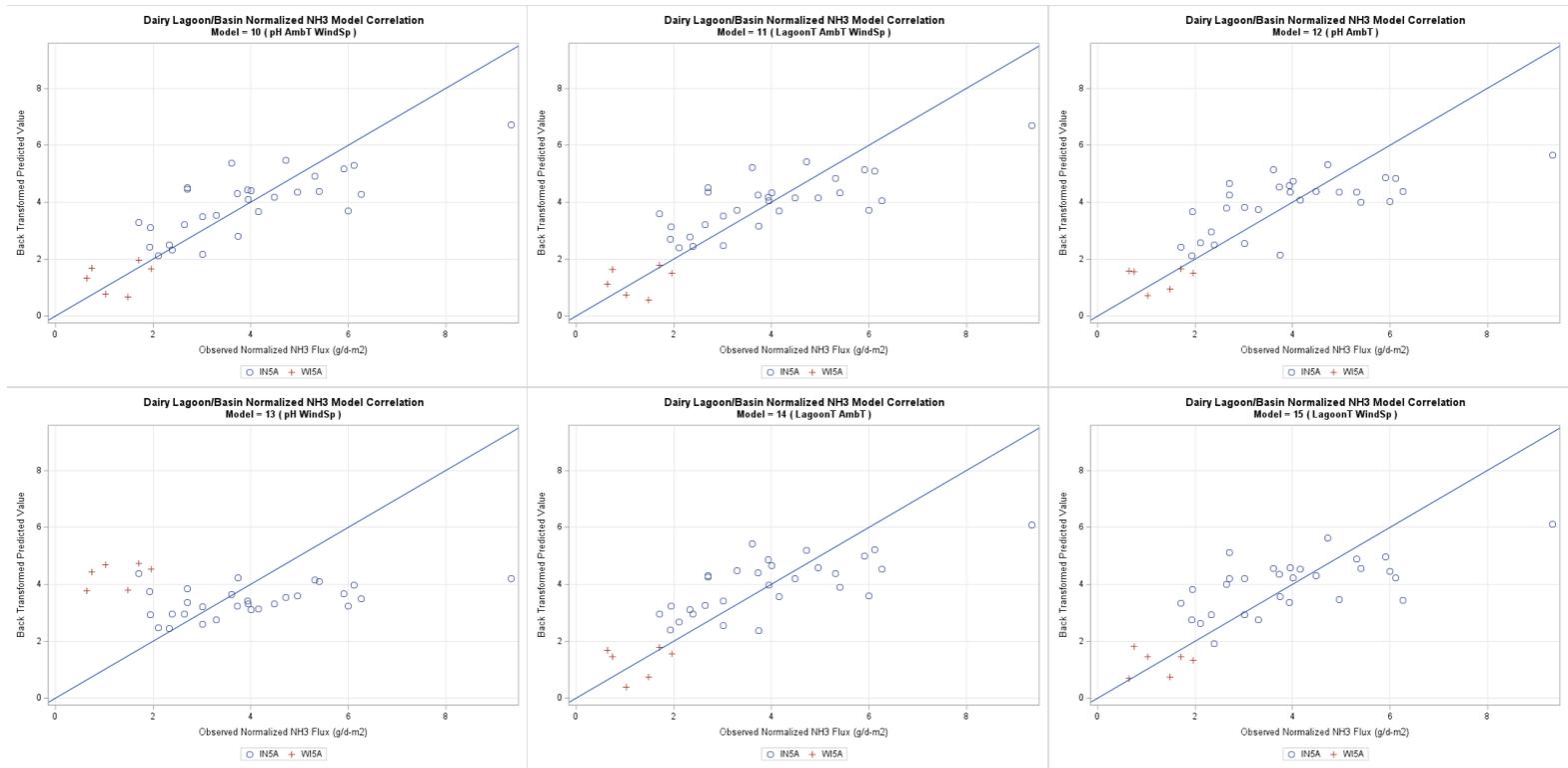


Figure G-70. Dairy lagoon NH₃ one-to-one plots models 10 through 15, back transformed.

G.4.2 Hydrogen Sulfide (H₂S)

Table G-36. Parameter and estimates H₂S emission models for dairy lagoons.

Model	Parameter	Estimate	Standard Error	p-value
1	Intercept	2.025152	0.48925	0.0015
	pH	-0.02631	0.05394	0.6347
	Lagoon temperature	-0.019651	0.00545	0.0042
2	Intercept	0.835524	0.4355	0.0939
	pH	0.07913	0.05889	0.2177
3	Intercept	1.788655	0.06241	<.0001
	Lagoon temperature	-0.017479	0.00301	0.0003
4	Intercept	1.097897	0.06192	<.0001
	Ambient temperature	0.010035	0.00221	<.0001
	Wind speed	0.028266	0.01635	0.0883
5	Intercept	1.189272	0.03163	<.0001
	Ambient temperature	0.010557	0.0022	<.0001
6	Intercept	1.096039	0.06837	<.0001
	Wind speed	0.050923	0.01682	0.0035
7	Intercept	2.238441	0.45542	0.0002
	pH	-0.078948	0.05614	0.1808
	Lagoon temperature	-0.016463	0.00848	0.074
	Ambient temperature	-0.001524	0.00708	0.8328
	Wind speed	0.051834	0.02703	0.0745
8	Intercept	2.065969	0.50043	0.0014
	pH	-0.032196	0.05637	0.5784
	Lagoon temperature	-0.017075	0.00926	0.0873
	Ambient temperature	-0.002616	0.0075	0.733
9	Intercept	2.211002	0.43846	0.0002
	pH	-0.07547	0.05381	0.1831
	Lagoon temperature	-0.017868	0.00496	0.0076
	Wind speed	0.052399	0.02715	0.0728
10	Intercept	1.263457	0.54647	<i>0.0382</i>
	pH	-0.002854	0.06568	0.9662
	Ambient temperature	-0.003814	0.0053	0.4825
	Wind speed	0.100247	0.02692	0.0019
11	Intercept	1.315891	0.18564	<.0001
	Lagoon temperature	-0.005659	0.01032	0.5933
	Ambient temperature	-0.000177	0.00734	0.9811
	Wind speed	0.091226	0.0328	<i>0.014</i>
12	Intercept	1.739304	0.51573	0.0048
	pH	-0.006914	0.05981	0.9096
	Ambient temperature	-0.01326	0.00475	<i>0.016</i>
13	Intercept	0.955639	0.35017	<i>0.0289</i>
	pH	0.029795	0.04902	0.5609
	Wind speed	0.097403	0.027	0.0026
14	Intercept	1.782638	0.07244	<.0001
	Lagoon temperature	-0.015974	0.00908	0.101
	Ambient temperature	-0.001281	0.00713	0.8602
15	Intercept	1.318016	0.1736	<.0001
	Lagoon temperature	-0.005881	0.00577	0.3379
	Wind speed	0.090879	0.03087	<i>0.011</i>

Table G-37. Fit and evaluation statistics for H₂S emission models for dairy lagoons.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (kg day ⁻¹ m ⁻²)	MB ^b (kg day ⁻¹ m ⁻²)	NMB ^b (%)
1	-36	-26	-20	-33	0.667	4.219	20.74	0.241	0.003	0.22
2	-32	-24	-20	-29	0.381	5.254	26.32	0.305	#NUM!	-0.02
3	-36	-28	-24	-33	0.652	4.379	21.67	0.252	0.003	0.262
4	-86	-76	-75	-81	0.657	9.05	62.46	0.489	-0.015	-1.925
5	-83	-75	-75	-79	0.632	9.258	63.69	0.499	-0.011	-1.403
6	-80	-72	-71	-75	0.07	13.58	84.47	0.673	0.007	0.868
7	-40	-26	-10	-35	0.776	3.094	15.3	0.178	0.001	0.056
8	-37	-25	-14	-32	0.663	4.275	20.97	0.244	0.002	0.193
9	-40	-28	-18	-36	0.777	3.103	15.56	0.181	0.001	0.074
10	-42	-30	-21	-38	0.732	3.624	17.87	0.207	0.003	0.271
11	-39	27	17	35	-0.76	3.535	17.47	0.203	0.003	0.215
12	-35	-25	-19	-32	0.519	4.647	23.1	0.268	0.004	0.355
13	-42	-32	-26	-38	0.702	3.736	18.36	0.213	0.002	0.195
14	-36	-26	-20	-33	0.648	4.406	21.83	0.254	0.003	0.252
15	-39	-29	-23	-36	0.757	3.527	17.43	0.203	0.002	0.21

^a Based on transformed data (i.e., ln(H₂S)).

^b Based on back-transformed data.

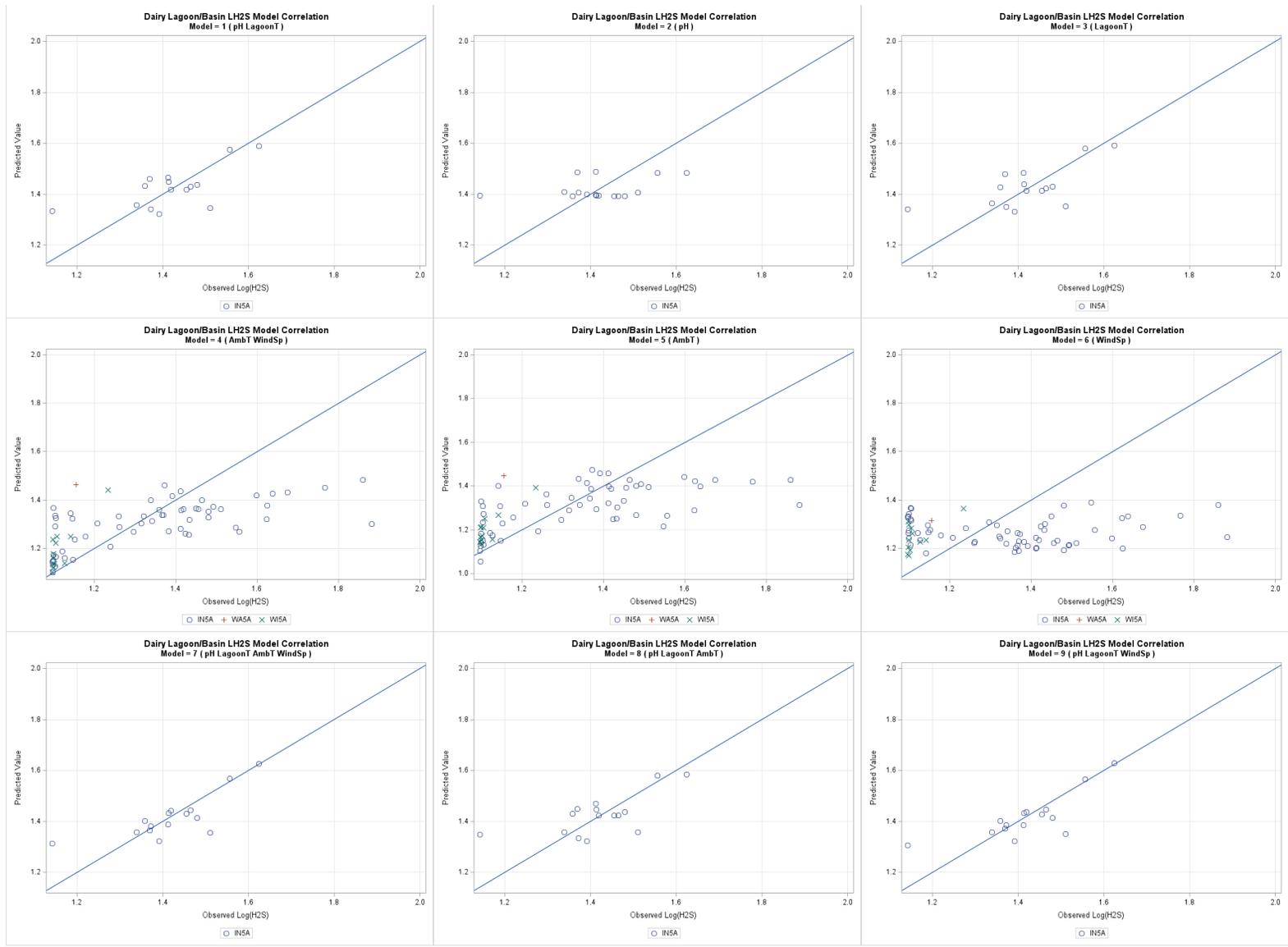


Figure G-71. Dairy lagoon H₂S one-to-one plots models 1 through 9, log transformed.

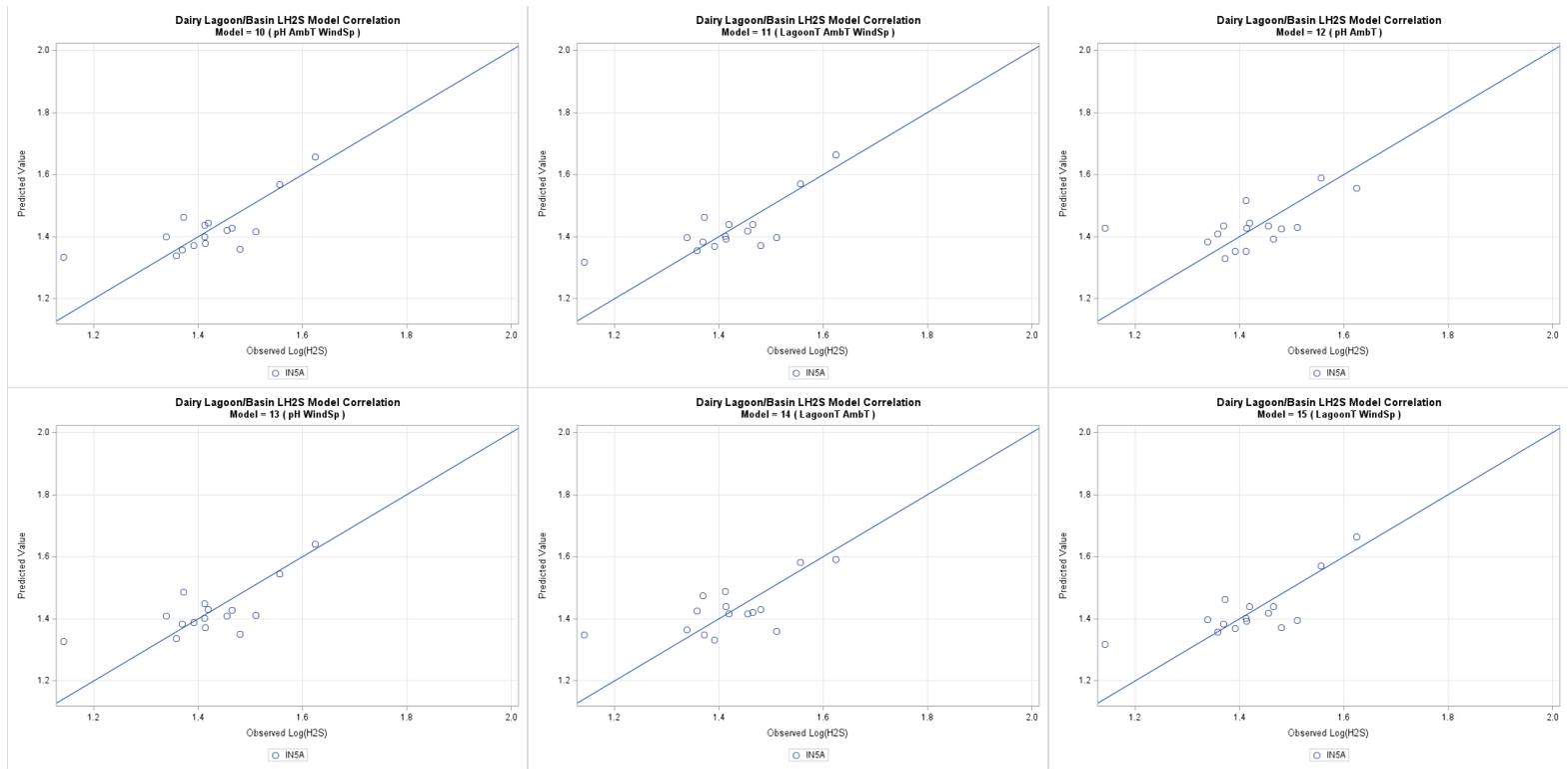


Figure G-72. Dairy lagoon H₂S one-to-one plots models 1 through 9, log transformed.

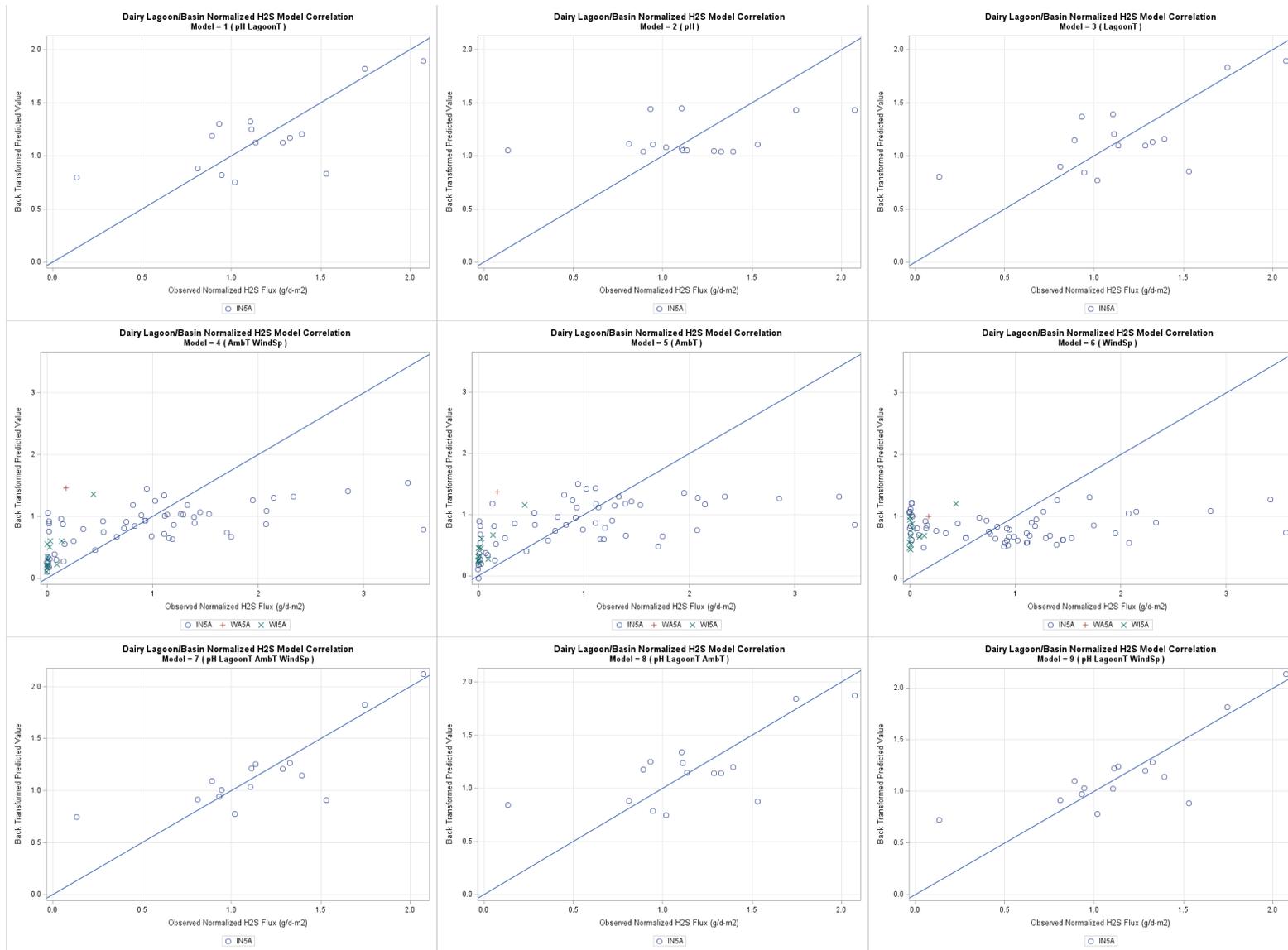


Figure G-73. Dairy lagoon H₂S one-to-one plots models 1 through 9, back transformed.

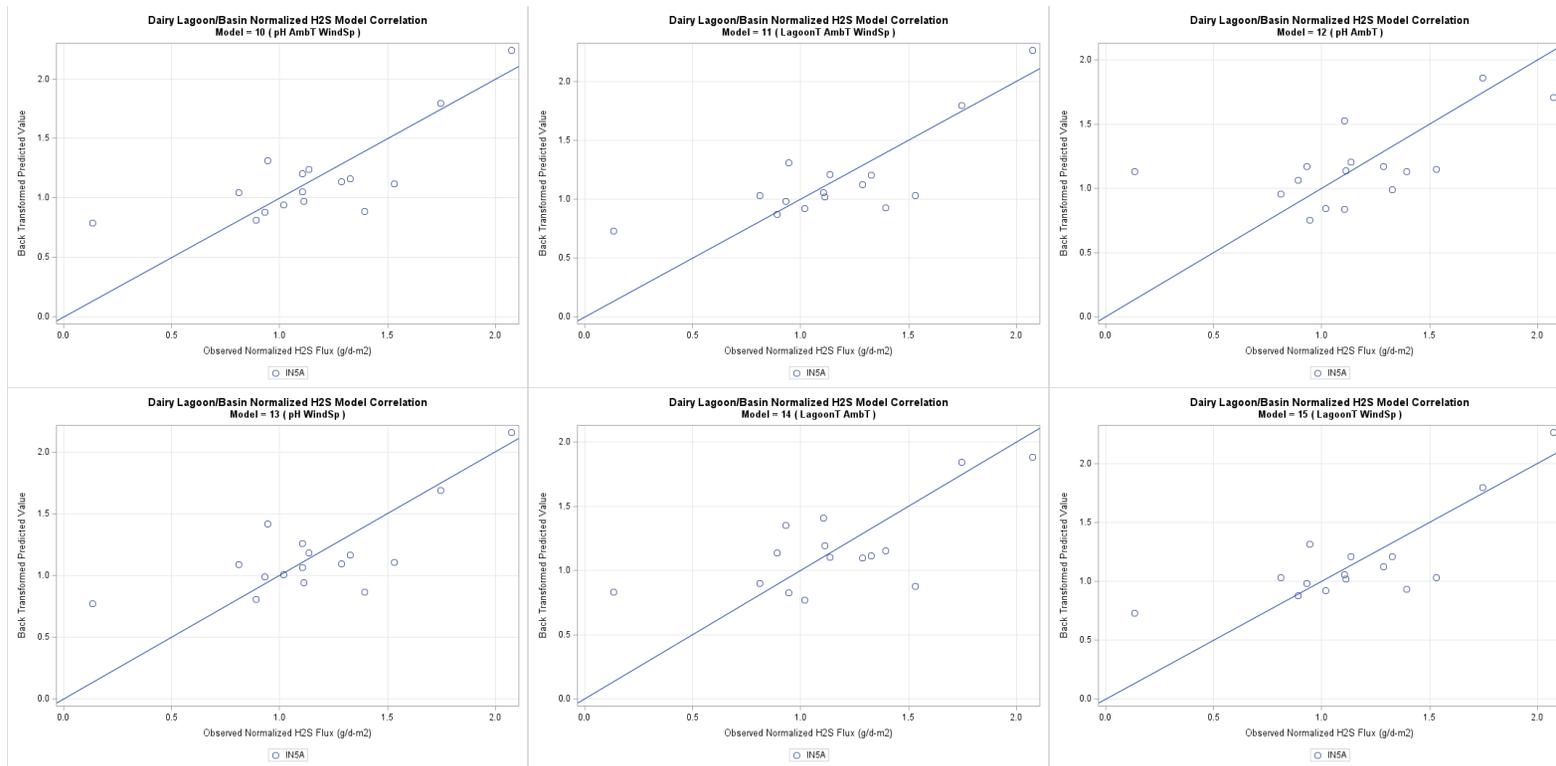


Figure G-74. Dairy lagoon H₂S one-to-one plots models 10 through 15, back transformed.

G.5 Corrals

G.5.1 Ammonia (NH₃)

Table G-38. Parameter and estimates NH₃ emission models for dairy corrals.

Model	Parameter	Estimate	Standard Error	p-value
CR-1a	Intercept	0.763691	0.20329	0.0004
	Ambient temperature	-0.009511	0.00852	0.2691
	Ambient relative humidity	0.012295	0.00291	<.0001
	Water vapor deficit	0.02969	0.01167	<i>0.0135</i>
	Wind speed	0.051483	0.02037	<i>0.0142</i>
CR-2a	Intercept	1.095199	0.16438	<.0001
	Ambient temperature	-0.007421	0.00896	0.411
	Ambient relative humidity	0.010416	0.00297	0.001
	Water vapor deficit	0.025559	0.0122	<i>0.0403</i>
CR-3a	Intercept	1.108679	0.15818	<.0001
	Ambient temperature	0.01048	0.00358	0.0063
	Ambient relative humidity	0.006897	0.00208	0.0016
	Wind speed	0.043973	0.02121	<i>0.0426</i>
CR-4a	Intercept	0.881656	0.17272	<.0001
	Ambient relative humidity	0.010059	0.00206	<.0001
	Water vapor deficit	0.017815	0.00466	0.0005
	Wind speed	0.049059	0.02044	<i>0.0196</i>
CR-5a	Intercept	1.497591	0.12214	<.0001
	Ambient temperature	0.016378	0.00684	<i>0.0203</i>
	Water vapor deficit	-0.007059	0.00898	0.4349
	Wind speed	0.030011	0.02259	0.1889
CR-6a	Intercept	1.351154	0.11265	<.0001
	Ambient temperature	0.009972	0.00371	<i>0.0118</i>
	Ambient relative humidity	0.005983	0.00212	0.0068
CR-7a	Intercept	1.633829	0.06663	<.0001
	Ambient temperature	0.015112	0.00688	<i>0.0327</i>
	Water vapor deficit	-0.006025	0.00911	0.5109
CR-8a	Intercept	1.171368	0.13154	<.0001
	Ambient relative humidity	0.008797	0.00211	0.0002
	Water vapor deficit	0.016432	0.00486	0.0019
CR-9a	Intercept	1.487014	0.12166	<.0001
	Ambient temperature	0.011907	0.00381	0.0038
	Wind speed	0.028613	0.02271	0.2124
CR-10a	Intercept	1.235356	0.16215	<.0001
	Ambient relative humidity	0.007641	0.00224	0.0012
	Wind speed	0.040427	0.02259	0.0787
CR-11a	Intercept	1.554303	0.12582	<.0001
	Water vapor deficit	0.010869	0.00526	<i>0.0449</i>
	Wind speed	0.023438	0.02372	0.3269
CR-12a	Intercept	1.619652	0.06236	<.0001
	Ambient temperature	0.011295	0.00376	0.0054
CR-13a	Intercept	1.452108	0.1134	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Ambient relative humidity	0.006779	0.00224	0.0039
CR-14a	Intercept	1.656264	0.06712	<.0001
	Water vapor deficit	0.010833	0.00518	0.0423
CR-15a	Intercept	1.630471	0.09345	<.0001
	Wind speed	0.036663	0.01958	0.0657
CR-1b	Intercept	0.897152	0.09258	<.0001
	Ambient temperature	-0.003981	0.0039	0.3115
	Ambient relative humidity	0.005528	0.00134	0.0001
	Water vapor deficit	0.013337	0.00531	0.0146
	Wind speed	0.02136	0.00912	0.0226
CR-2b	Intercept	1.03179	0.07648	<.0001
	Ambient temperature	-0.002965	0.00407	0.4692
	Ambient relative humidity	0.004789	0.00137	0.0009
	Water vapor deficit	0.011521	0.00551	0.0406
CR-3b	Intercept	1.053805	0.07073	<.0001
	Ambient temperature	0.004993	0.00173	0.0069
	Ambient relative humidity	0.0031	0.00095	0.0018
	Wind speed	0.017832	0.00937	0.0622
CR-4b	Intercept	0.946391	0.07858	<.0001
	Ambient relative humidity	0.004605	0.00096	<.0001
	Water vapor deficit	0.008399	0.0022	0.0005
	Wind speed	0.02021	0.00908	0.0301
CR-5b	Intercept	1.2253	0.05532	<.0001
	Ambient temperature	0.007602	0.00317	0.0199
	Water vapor deficit	-0.00327	0.00404	0.4214
	Wind speed	0.012747	0.01006	0.2102
CR-6b	Intercept	1.147634	0.05358	<.0001
	Ambient temperature	0.004878	0.00179	0.0103
	Ambient relative humidity	0.002795	0.00097	0.0057
CR-7b	Intercept	1.281746	0.03227	<.0001
	Ambient temperature	0.007244	0.0032	0.0278
	Water vapor deficit	-0.002941	0.00411	0.4768
CR-8b	Intercept	1.061536	0.06261	<.0001
	Ambient relative humidity	0.004155	0.00098	0.0001
	Water vapor deficit	0.007899	0.00228	0.0015
CR-9b	Intercept	1.219287	0.05483	<.0001
	Ambient temperature	0.005536	0.00182	0.0048
	Wind speed	0.012282	0.01015	0.2308
CR-10b	Intercept	1.114354	0.07143	<.0001
	Ambient relative humidity	0.003353	0.00102	0.0017
	Wind speed	0.017336	0.00988	0.0847
CR-11b	Intercept	1.248844	0.05728	<.0001
	Water vapor deficit	0.004788	0.00248	0.0597
	Wind speed	0.010938	0.01066	0.309
CR-12b	Intercept	1.274696	0.03019	<.0001
	Ambient temperature	0.005373	0.00181	0.0057

Model	Parameter	Estimate	Standard Error	p-value
CR-13b	Intercept	1.202252	0.05362	<.0001
	Ambient relative humidity	0.003084	0.00104	0.0045
CR-14b	Intercept	1.294429	0.03205	<.0001
	Water vapor deficit	0.004931	0.00243	0.0487
CR-15b	Intercept	1.280846	0.04185	<.0001
	Wind speed	0.017141	0.00848	0.0477

Table G-39. Fit and evaluation statistics for NH₃ emission models for dairy corrals.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (kg day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
CR-1a	-64	-50	-47	-35	0.611	7.499	27.48	0.847	0.002	0.05
CR-2a	-57	-45	-44	-32	0.566	8.023	29.51	0.91	0.01	0.321
CR-3a	-57	-45	-44	-32	0.567	7.746	28.54	0.88	-0.003	-0.101
CR-4a	-62	-50	-49	-38	0.603	7.611	27.83	0.858	0.003	0.082
CR-5a	-47	-35	-33	-22	0.416	8.813	32.02	0.987	0.001	0.026
CR-6a	-53	-43	-42	-32	0.526	8.07	29.73	0.917	0.007	0.228
CR-7a	-45	-35	-34	-24	0.414	8.675	31.57	0.973	0.002	0.062
CR-8a	-56	-46	-45	-36	0.558	8.124	29.81	0.919	0.013	0.415
CR-9a	-46	-36	-35	-26	0.398	8.943	32.66	1.007	0.002	0.078
CR-10a	-49	-39	-38	-28	0.437	7.982	29.41	0.907	-0.004	-0.126
CR-11a	-41	31	30	21	-0.27	8.935	33.05	1.019	0.001	0.046
CR-12a	-45	-37	-36	-28	0.402	8.815	32.06	0.988	0.002	0.066
CR-13a	-45	-37	-37	-29	0.425	8.108	29.36	0.905	-0.003	-0.101
CR-14a	-40	-32	-32	-24	0.306	8.839	32.59	1.005	-0.002	-0.075
CR-15a	-49	-41	-40	-32	-0.02	8.626	31.34	0.978	0.012	0.377
CR-1b	-162	-148	-146	-133	0.62	4.549	28.02	0.247	0.000	-0.01
CR-2b	-156	-144	-143	-132	0.583	4.826	29.79	0.263	0.001	0.143
CR-3b	-156	-144	-142	-131	0.572	4.746	29.19	0.257	0.000	-0.055
CR-4b	-161	-149	-147	-136	0.611	4.613	28.45	0.251	0.000	0.022
CR-5b	-146	-134	-133	-121	0.432	5.359	32.67	0.288	0.000	-0.016
CR-6b	-152	-142	-141	-131	0.54	4.925	30.31	0.267	0.001	0.119
CR-7b	-144	-134	-133	-124	0.435	5.267	32.17	0.284	0.000	0.014
CR-8b	-156	-146	-145	-135	0.575	4.89	30.17	0.266	0.002	0.195
CR-9b	-145	-135	-134	-125	0.417	5.444	33.25	0.293	0.000	0.001
CR-10b	-148	-138	-137	-127	0.423	4.829	29.86	0.263	-0.001	-0.08
CR-11b	-140	-130	-129	-120	0.284	5.485	33.7	0.297	0.000	-0.018
CR-12b	0	-136	-135	-127	0.426	5.337	32.66	0.288	0.000	0.007
CR-13b	-145	-137	-136	-128	0.423	4.804	29.51	0.26	-0.001	-0.064
CR-14b	-139	-131	-130	-123	0.334	5.402	33.29	0.293	-0.001	-0.08
CR-15b	-166	-158	-158	-149	-0.05	5.31	32.04	0.285	0.002	0.198

^a Based on transformed data (i.e., ln(NH₃)).

^b Based on back-transformed data.

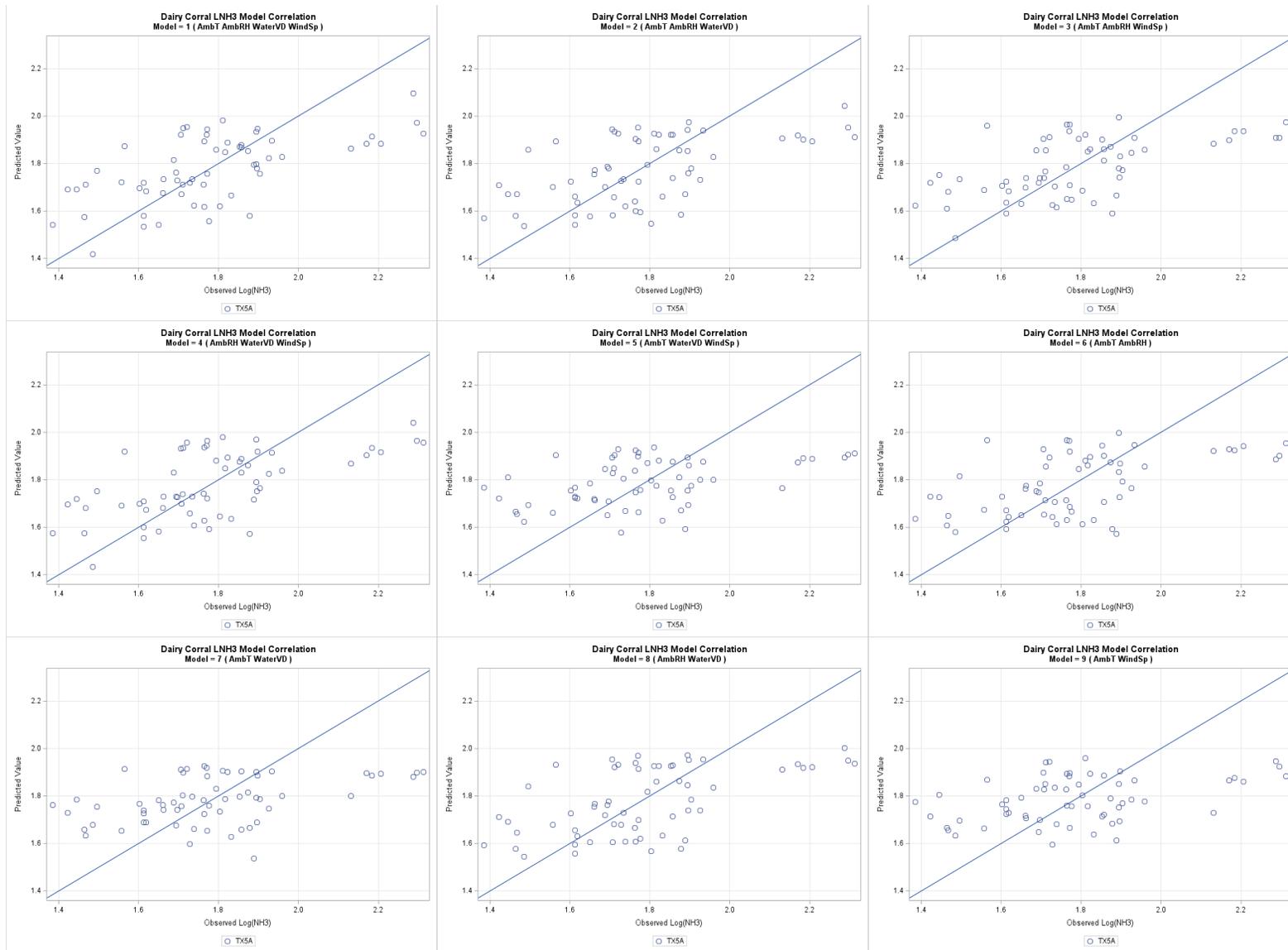


Figure G-75. Dairy corral NH₃ one-to-one plots models 1a through 9a, log transformed.

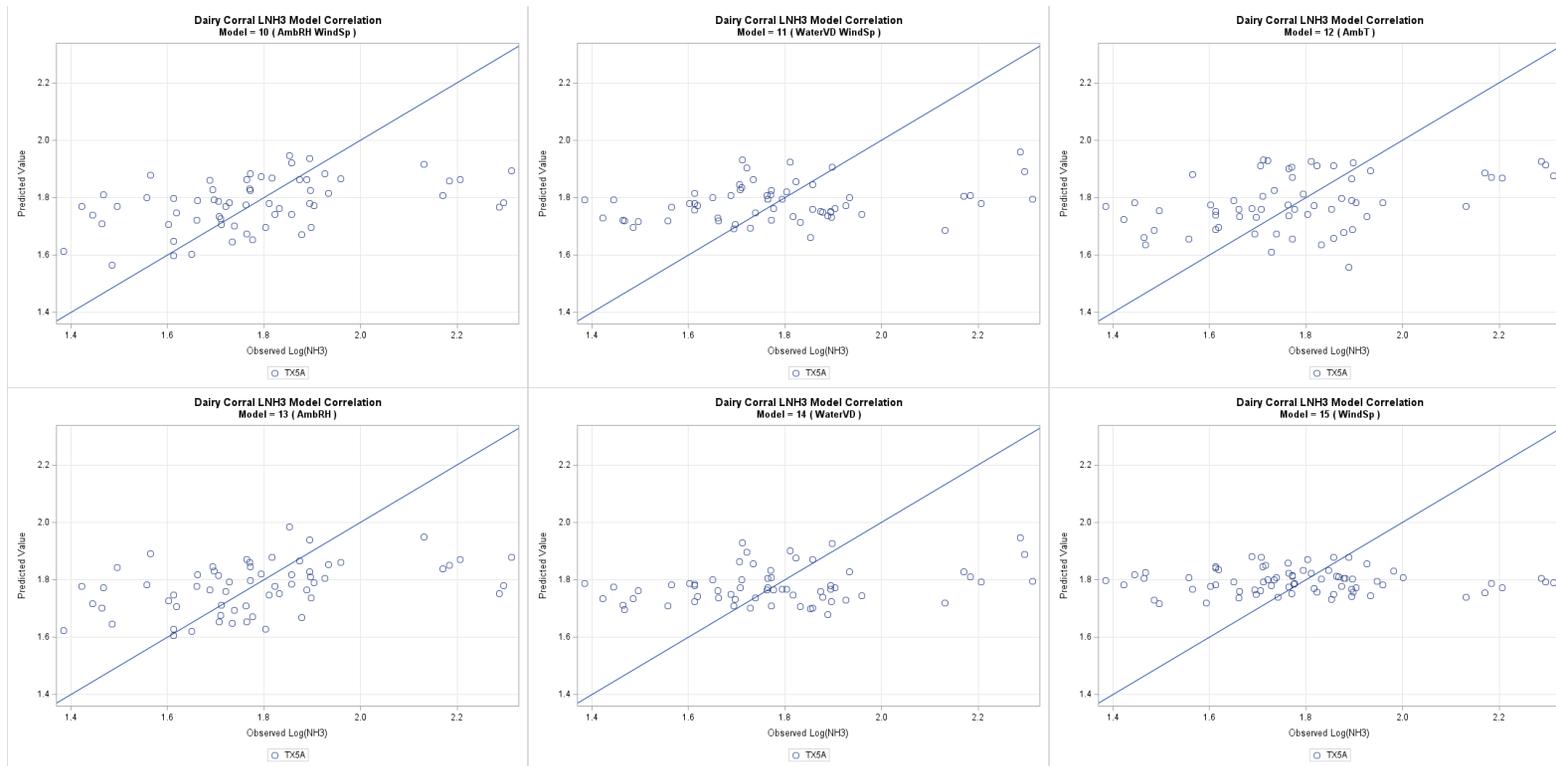


Figure G-76. Dairy corral NH₃ one-to-one plots models 10a through 15a, log transformed.

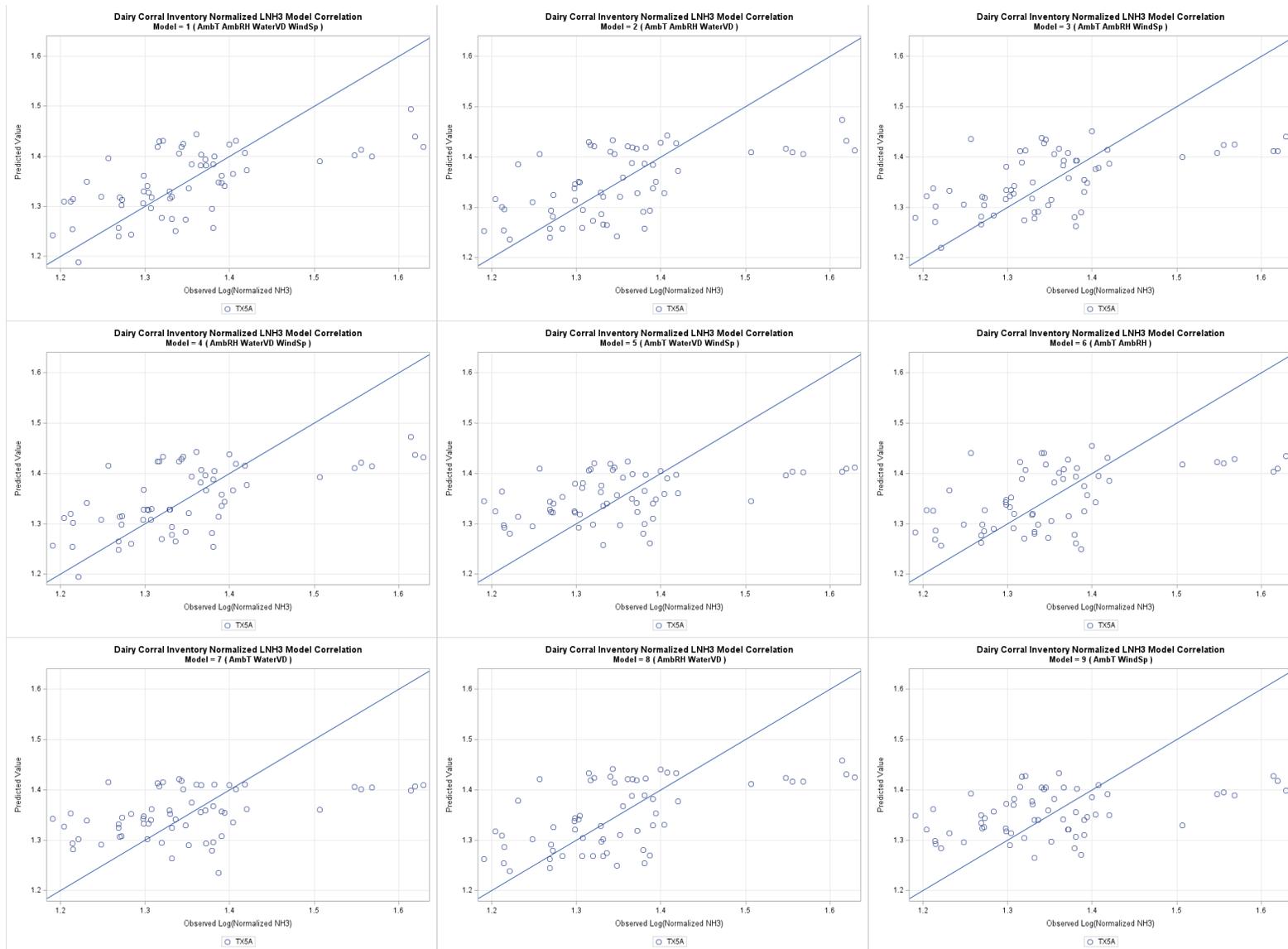


Figure G-77. Dairy corral NH₃ one-to-one plots models 1b through 9b, log transformed.

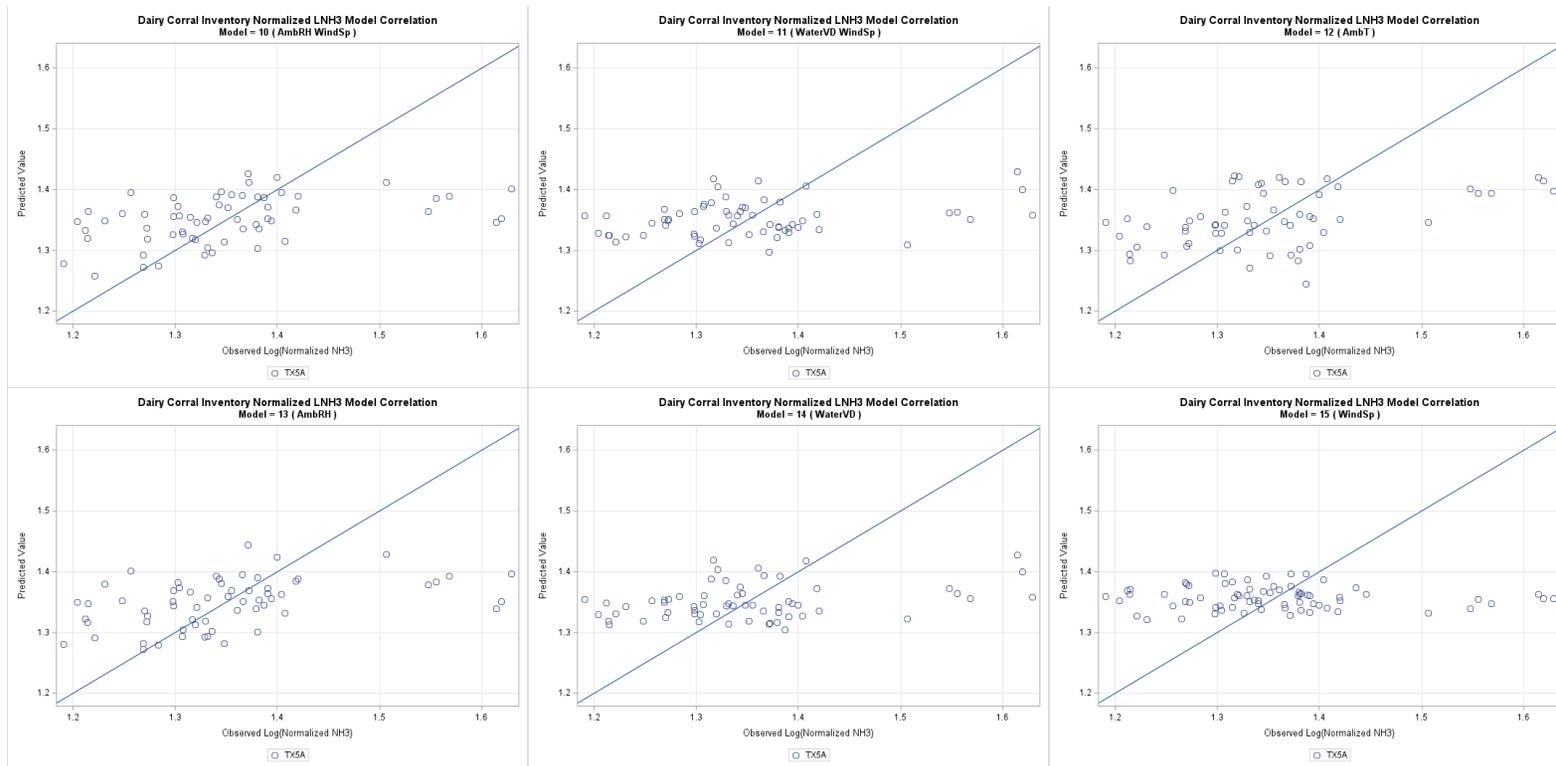


Figure G-78. Dairy corral NH₃ one-to-one plots models 10b through 15b, log transformed.

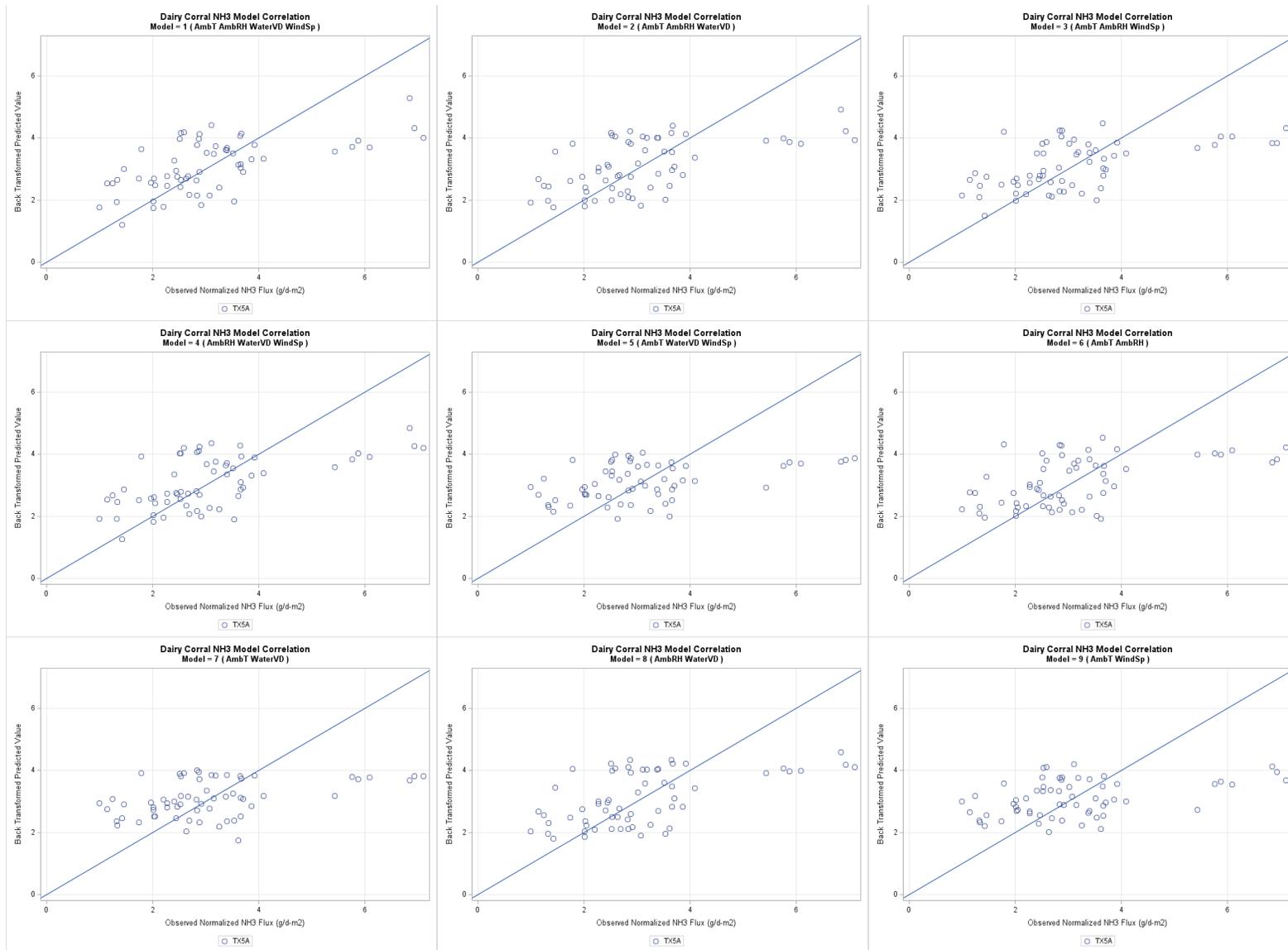


Figure G-79. Dairy corral NH₃ one-to-one plots models 1a through 9a, back transformed.

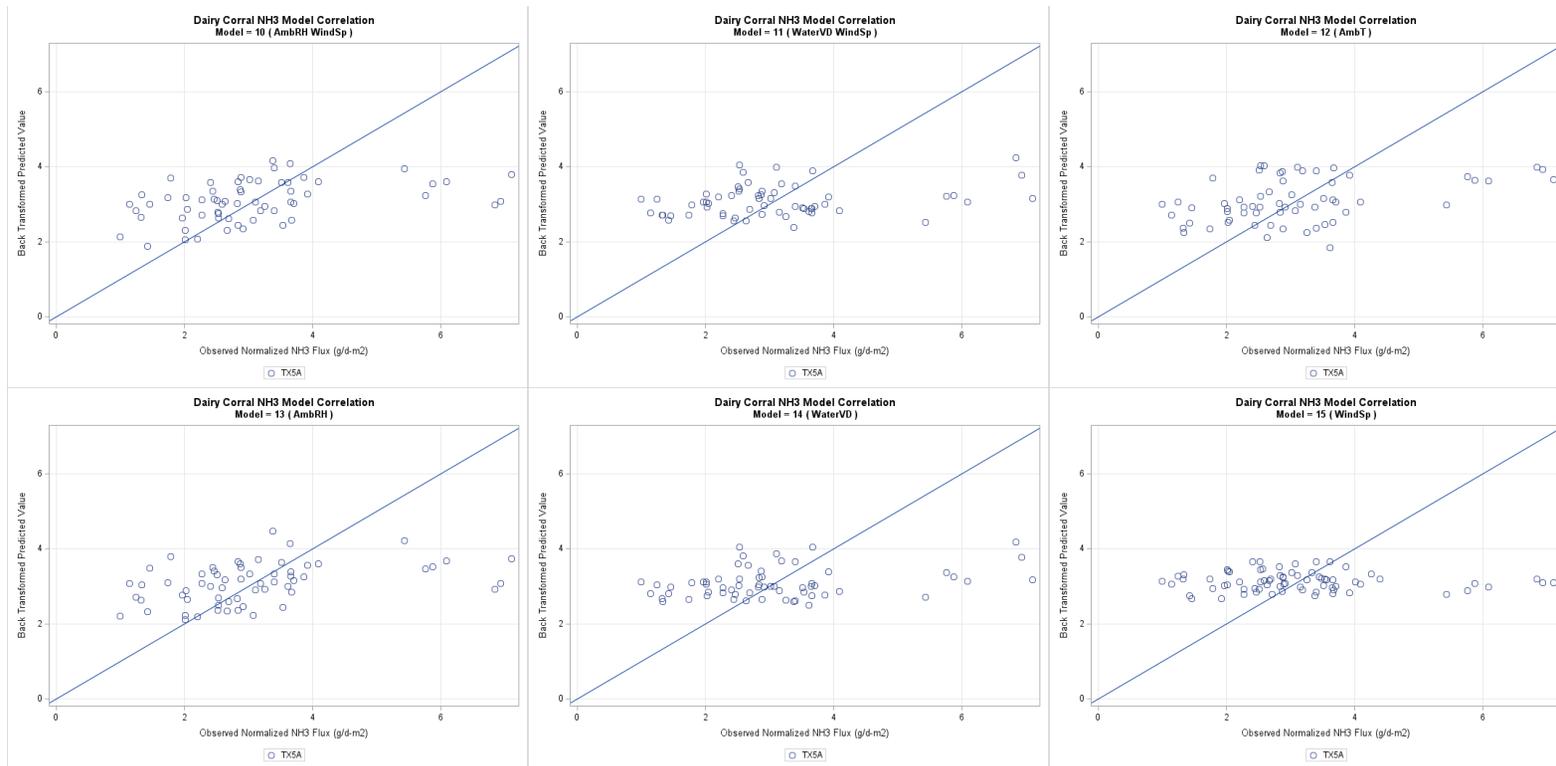


Figure G-80. Dairy corral NH₃ one-to-one plots models 10a through 15a, back transformed.

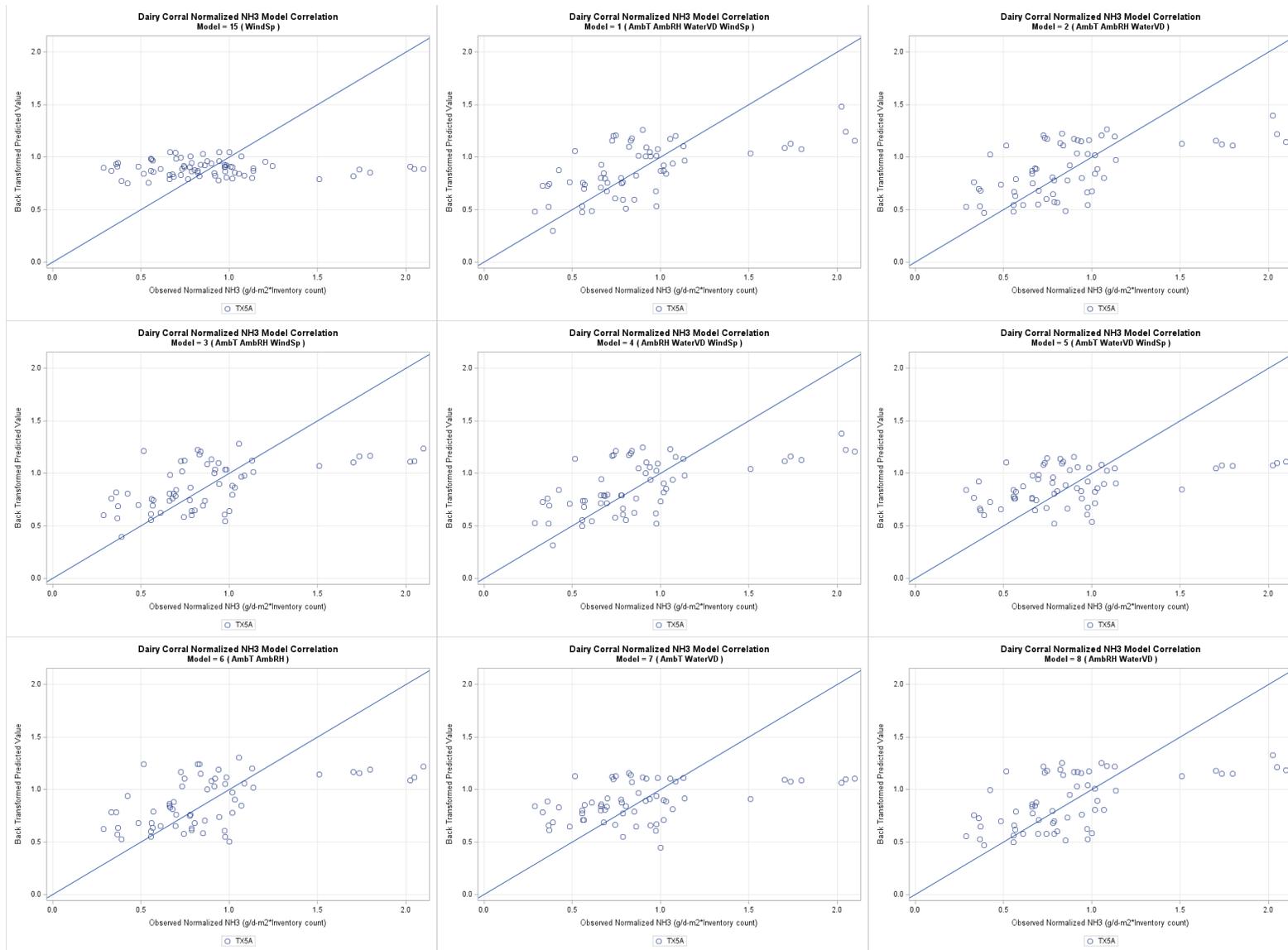


Figure G-81. Dairy corral NH₃ one-to-one plots models 1b through 9b, back transformed.

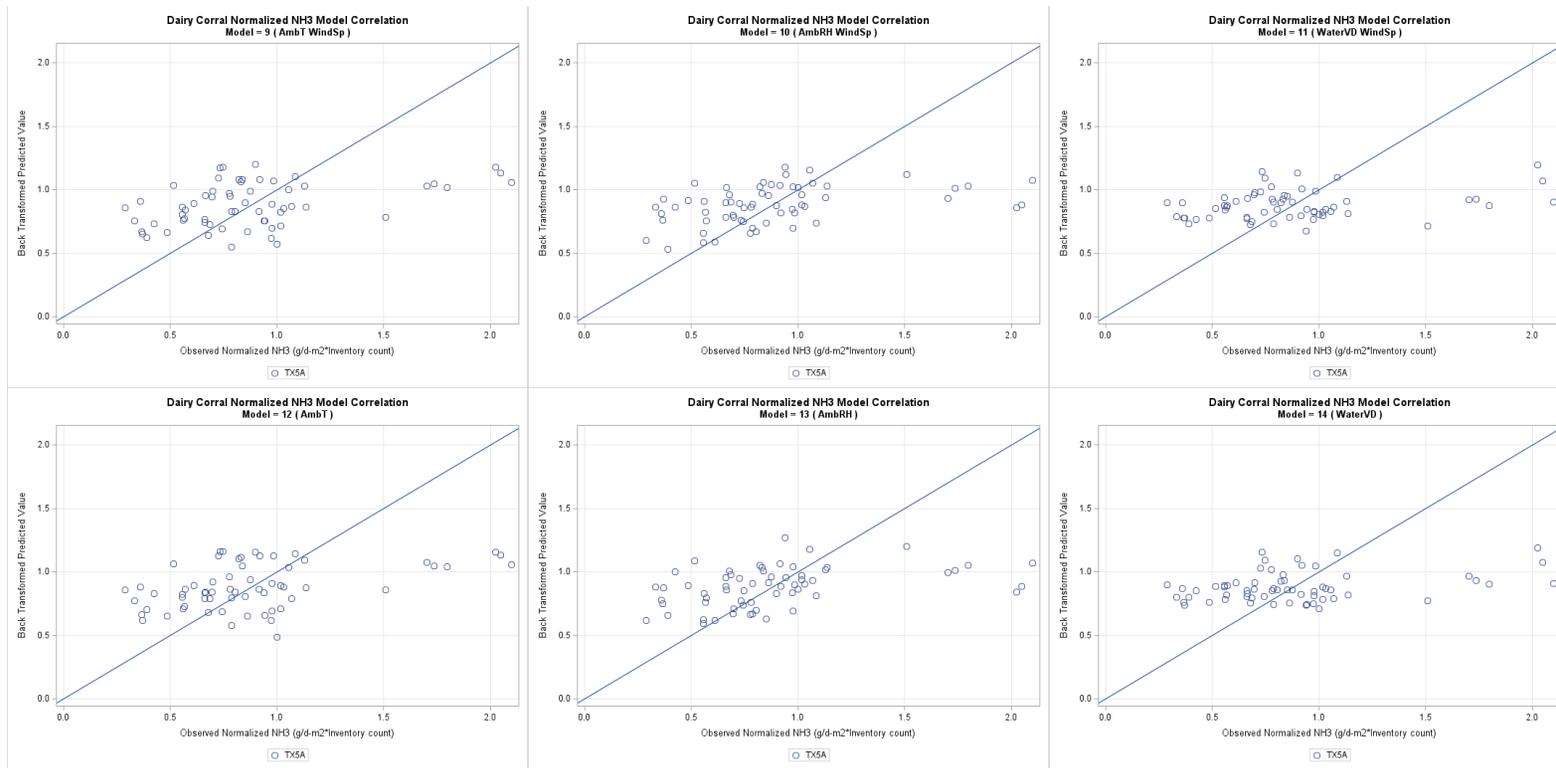


Figure G-82. Dairy corral NH₃ one-to-one plots models 10b through 15b, back transformed.

G.5.2 Hydrogen Sulfide (H₂S)

Table G-40. Parameter and estimates H₂S emission models for dairy corrals.

Model	Parameter	Estimate	Standard Error	p-value
CR-1a	Intercept	2.970638	0.50444	<.0001
	Ambient temperature	-0.009345	0.01773	0.601
	Ambient relative humidity	0.012274	0.00727	0.0994
	Water vapor deficit	0.010058	0.02412	0.6787
	Wind speed	0.068824	0.04038	0.0957
CR-2a	Intercept	3.419792	0.41522	<.0001
	Ambient temperature	-0.001785	0.01752	0.9193
	Ambient relative humidity	0.008789	0.00695	0.2139
	Water vapor deficit	0.00194	0.0241	0.9362
CR-3a	Intercept	3.136866	0.31165	<.0001
	Ambient temperature	-0.002867	0.00806	0.726
	Ambient relative humidity	0.009747	0.00411	<i>0.0222</i>
	Wind speed	0.06504	0.03878	0.1011
CR-4a	Intercept	3.139137	0.39428	<.0001
	Ambient relative humidity	0.009432	0.00498	0.067
	Water vapor deficit	-0.00146	0.011	0.8956
	Wind speed	0.062441	0.03826	0.1113
CR-5a	Intercept	3.755593	0.20355	<.0001
	Ambient temperature	0.011631	0.01281	0.3698
	Water vapor deficit	-0.02361	0.01369	0.0926
	Wind speed	0.049549	0.03869	0.2072
CR-6a	Intercept	3.447268	0.24975	<.0001
	Ambient temperature	-0.000519	0.00788	0.948
	Ambient relative humidity	0.008329	0.00411	<i>0.0491</i>
CR-7a	Intercept	3.923743	0.15146	<.0001
	Ambient temperature	0.014019	0.01286	0.2819
	Water vapor deficit	-0.023084	0.01418	0.1115
CR-8a	Intercept	3.446605	0.33784	<.0001
	Ambient relative humidity	0.008265	0.00492	0.1037
	Water vapor deficit	-0.000304	0.01087	0.9779
CR-9a	Intercept	3.714552	0.20898	<.0001
	Ambient temperature	-0.004232	0.0091	0.647
	Wind speed	0.047206	0.04025	0.2473
CR-10a	Intercept	3.104242	0.3003	<.0001
	Ambient relative humidity	0.00982	0.00412	<i>0.0214</i>
	Wind speed	0.062062	0.03834	0.1142
CR-11a	Intercept	3.787018	0.2035	<.0001
	Water vapor deficit	-0.014936	0.00973	0.1324
	Wind speed	0.057853	0.03842	0.1403
CR-12a	Intercept	3.873591	0.15106	<.0001
	Ambient temperature	-0.00154	0.00858	0.859
CR-13a	Intercept	3.439236	0.21621	<.0001
	Ambient relative humidity	0.008342	0.00412	<i>0.049</i>
CR-14a	Intercept	3.984094	0.14367	<.0001
	Water vapor deficit	-0.011103	0.00958	0.2531
CR-15a	Intercept	3.666611	0.18136	<.0001

Model	Parameter	Estimate	Standard Error	p-value
	Wind speed	0.039609	0.03675	0.2875
CR-1b	Intercept	2.017076	0.44535	<.0001
	Ambient temperature	-0.007493	0.01562	0.6338
	Ambient relative humidity	0.010275	0.00643	0.1177
	Water vapor deficit	0.007516	0.02113	0.7237
	Wind speed	0.060242	0.03519	0.0943
CR-2b	Intercept	2.405151	0.37002	<.0001
	Ambient temperature	-0.000322	0.01532	0.9833
	Ambient relative humidity	0.007217	0.00615	0.2477
	Water vapor deficit	0.000192	0.02107	0.9928
CR-3b	Intercept	2.143018	0.27163	<.0001
	Ambient temperature	-0.002677	0.00729	0.7172
	Ambient relative humidity	0.008365	0.00359	<i>0.0244</i>
	Wind speed	0.057368	0.03371	0.0963
CR-4b	Intercept	2.152013	0.34858	<.0001
	Ambient relative humidity	0.008004	0.00443	0.0798
	Water vapor deficit	-0.001621	0.0099	0.8713
	Wind speed	0.054825	0.03306	0.106
CR-5b	Intercept	2.675305	0.17806	<.0001
	Ambient temperature	0.00986	0.01132	0.3891
	Water vapor deficit	-0.020596	0.01183	0.0898
	Wind speed	0.044353	0.03369	0.195
CR-6b	Intercept	2.407912	0.22223	<.0001
	Ambient temperature	-0.000198	0.00707	0.9779
	Ambient relative humidity	0.007171	0.00361	0.0534
CR-7b	Intercept	2.821316	0.13542	<.0001
	Ambient temperature	0.012414	0.0113	0.2782
	Water vapor deficit	-0.020249	0.01229	0.1073
CR-8b	Intercept	2.410015	0.30355	<.0001
	Ambient relative humidity	0.007122	0.00438	0.1149
	Water vapor deficit	-0.000212	0.00975	0.9828
CR-9b	Intercept	2.637725	0.1827	<.0001
	Ambient temperature	-0.004004	0.00815	0.6284
	Wind speed	0.042679	0.03505	0.2301
CR-10b	Intercept	2.113231	0.26144	<.0001
	Ambient relative humidity	0.008445	0.00359	<i>0.0233</i>
	Wind speed	0.054306	0.0331	0.1097
CR-11b	Intercept	2.701641	0.17821	<.0001
	Water vapor deficit	-0.013503	0.00851	0.1197
	Wind speed	0.052106	0.03317	0.1245
CR-12b	Intercept	2.777138	0.135	<.0001
	Ambient temperature	-0.001264	0.00763	0.8697
CR-13b	Intercept	2.404792	0.1906	<.0001
	Ambient relative humidity	0.007177	0.00361	0.0531
CR-14b	Intercept	2.876877	0.12785	<.0001
	Water vapor deficit	-0.009855	0.0084	0.2473
CR-15b	Intercept	2.593193	0.15874	<.0001
	Wind speed	0.035442	0.03174	0.2708

Table G-41. Fit and evaluation statistics for H₂S emission models for dairy corrals.

Model	2LogL	AIC	AICc	BIC	Corr.	LNME ^a (%)	NME ^b (%)	ME ^b (kg day ⁻¹)	MB ^b (kg day ⁻¹)	NMB ^b (%)
CR-1a	5	19	22	31	0.351	6.373	26.37	11.92	-0.041	-0.091
CR-2a	8	20	22	30	0.4	6.315	26.24	11.86	-0.207	-0.458
CR-3a	5	17	19	28	0.324	6.449	26.66	12.05	-0.041	-0.09
CR-4a	5	17	19	28	0.338	6.476	26.72	12.07	-0.082	-0.181
CR-5a	8	20	22	30	0.09	6.755	27.81	12.56	0.147	0.325
CR-6a	8	18	19	27	0.395	6.339	26.32	11.89	-0.204	-0.451
CR-7a	9	19	21	28	0.211	6.638	27.39	12.38	-0.086	-0.19
CR-8a	8	18	19	27	0.394	6.353	26.37	11.92	-0.199	-0.44
CR-9a	11	21	22	30	-0.1	6.785	28.27	12.78	0.354	0.783
CR-10a	5	15	17	24	0.349	6.471	26.7	12.07	-0.094	-0.209
CR-11a	9	-19	-20	-27	-0	7.098	29.26	13.22	0.596	1.319
CR-12a	12	20	21	27	-0.02	6.56	27.48	12.42	-0.001	-0.002
CR-13a	8	16	17	23	0.394	6.356	26.38	11.92	-0.197	-0.435
CR-14a	11	19	20	26	0.089	6.496	26.9	12.16	0.039	0.086
CR-15a	9	17	18	25	-0.12	6.694	27.9	12.32	0.173	0.392
CR-1b	-7	7	10	20	0.319	8.137	27.72	3.596	0.001	0.008
CR-2b	-4	8	10	19	0.387	7.975	27.12	3.518	-0.048	-0.37
CR-3b	-7	5	8	16	0.294	8.223	27.94	3.624	0.003	0.021
CR-4b	-7	5	8	16	0.31	8.165	27.66	3.589	-0.01	-0.075
CR-5b	-4	8	10	18	0.058	8.556	29.04	3.767	0.056	0.43
CR-6b	-4	6	8	15	0.386	7.978	27.12	3.519	-0.048	-0.369
CR-7b	-3	7	9	16	0.198	8.364	28.31	3.673	-0.015	-0.113
CR-8b	-4	6	8	15	0.385	7.985	27.14	3.521	-0.048	-0.366
CR-9b	-1	9	10	18	-0.12	8.677	29.63	3.844	0.104	0.801
CR-10b	-6	4	5	12	0.327	8.135	27.55	3.574	-0.015	-0.119
CR-11b	-3	7	8	15	-0.02	9.083	30.79	3.995	0.179	1.38
CR-12b	0	8	9	15	-0.04	8.288	28.39	3.683	0.001	0.006
CR-13b	-4	4	5	11	0.386	7.988	27.15	3.522	-0.047	-0.364
CR-14b	-1	7	8	14	0.066	8.244	27.94	3.625	0.02	0.157
CR-15b	-4	4	5	12	-0.13	8.441	28.85	3.654	0.048	0.377

^a Based on transformed data (i.e., ln(H₂S)).

^b Based on back-transformed data.

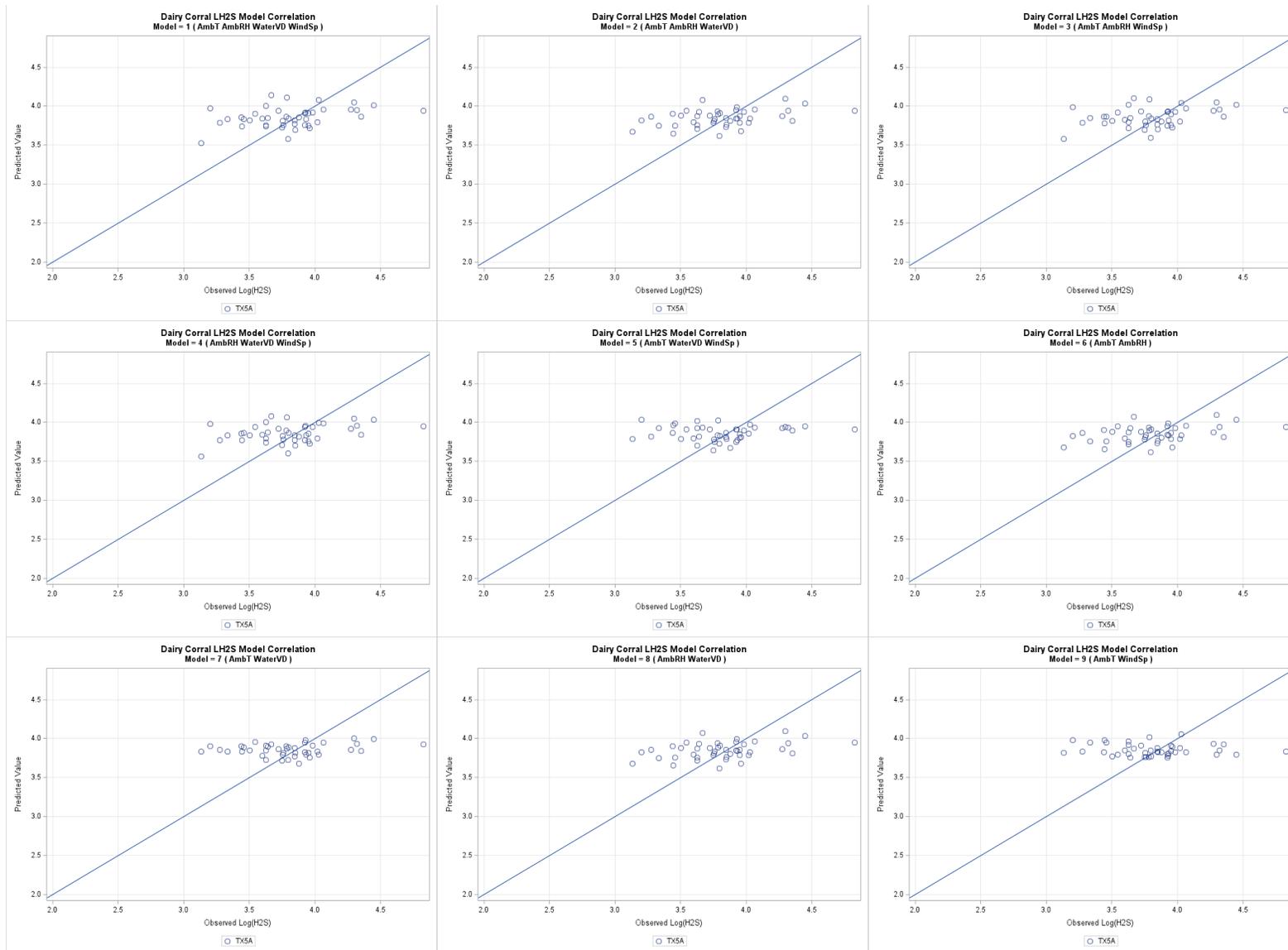


Figure G-83. Dairy corral H₂S one-to-one plots models 1a through 9a, log transformed.

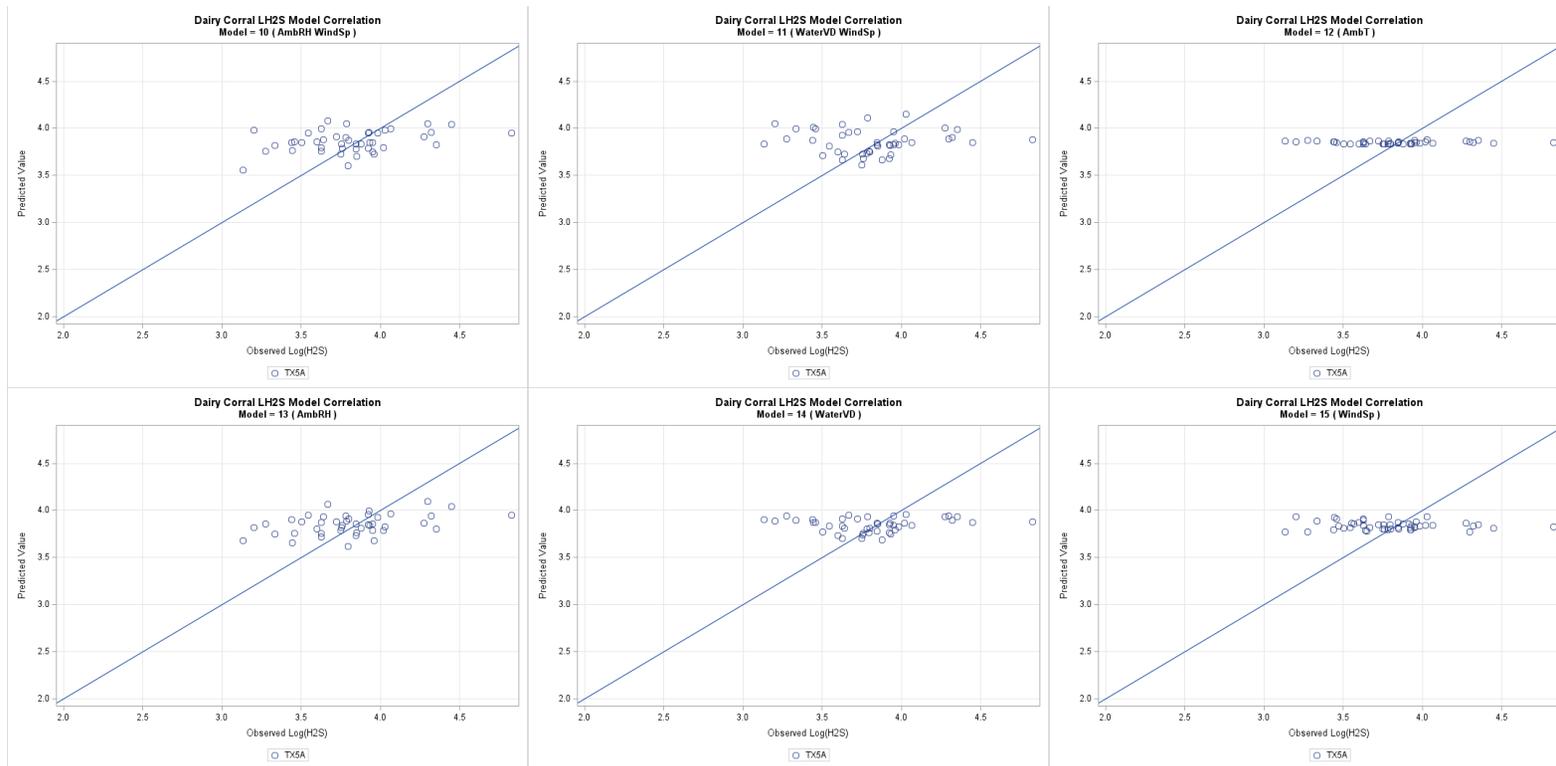


Figure G-84. Dairy corral H₂S one-to-one plots models 10a through 15a, log transformed.

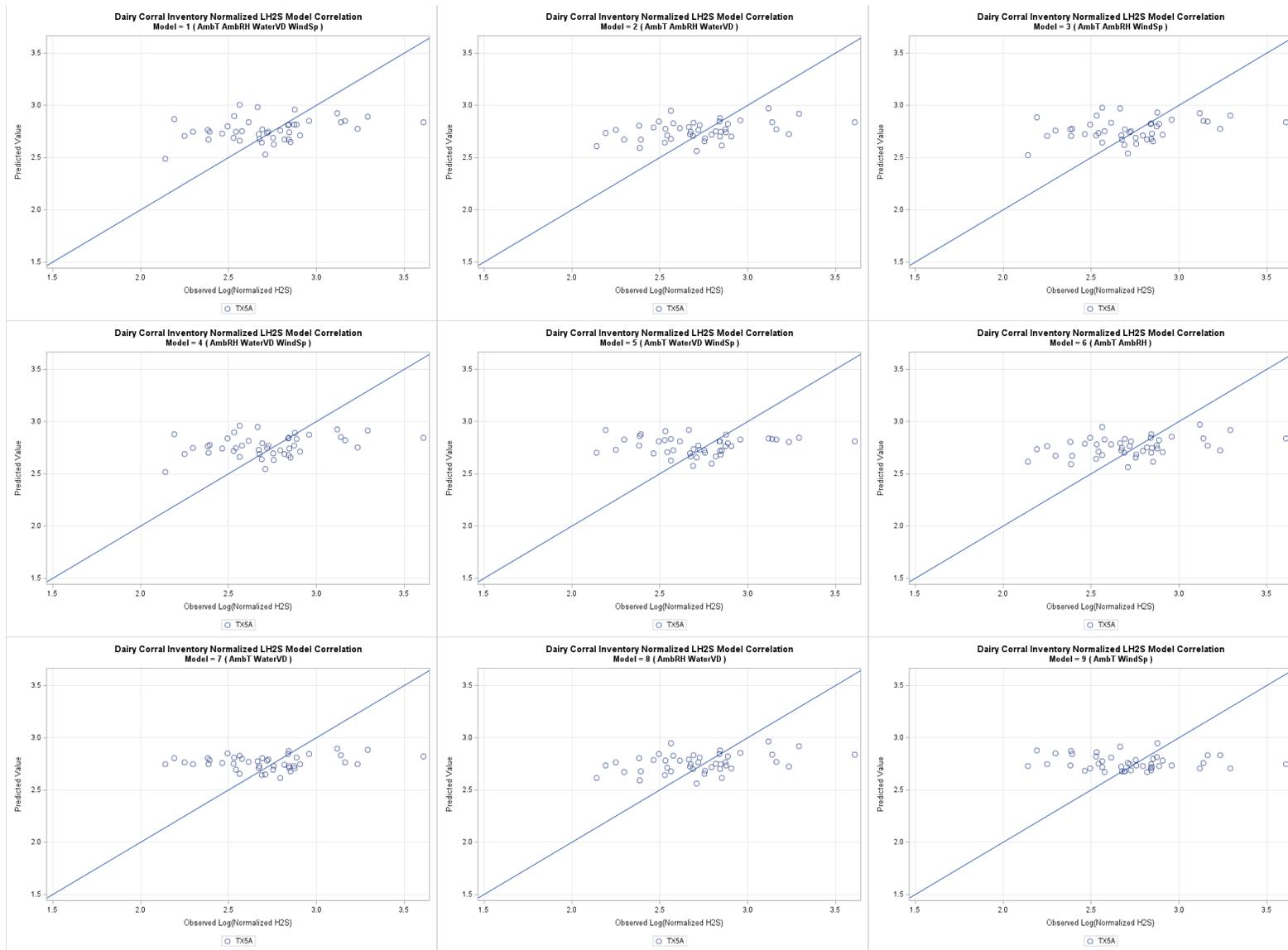


Figure G-85. Dairy corral H₂S one-to-one plots models 1b through 9b, log transformed.

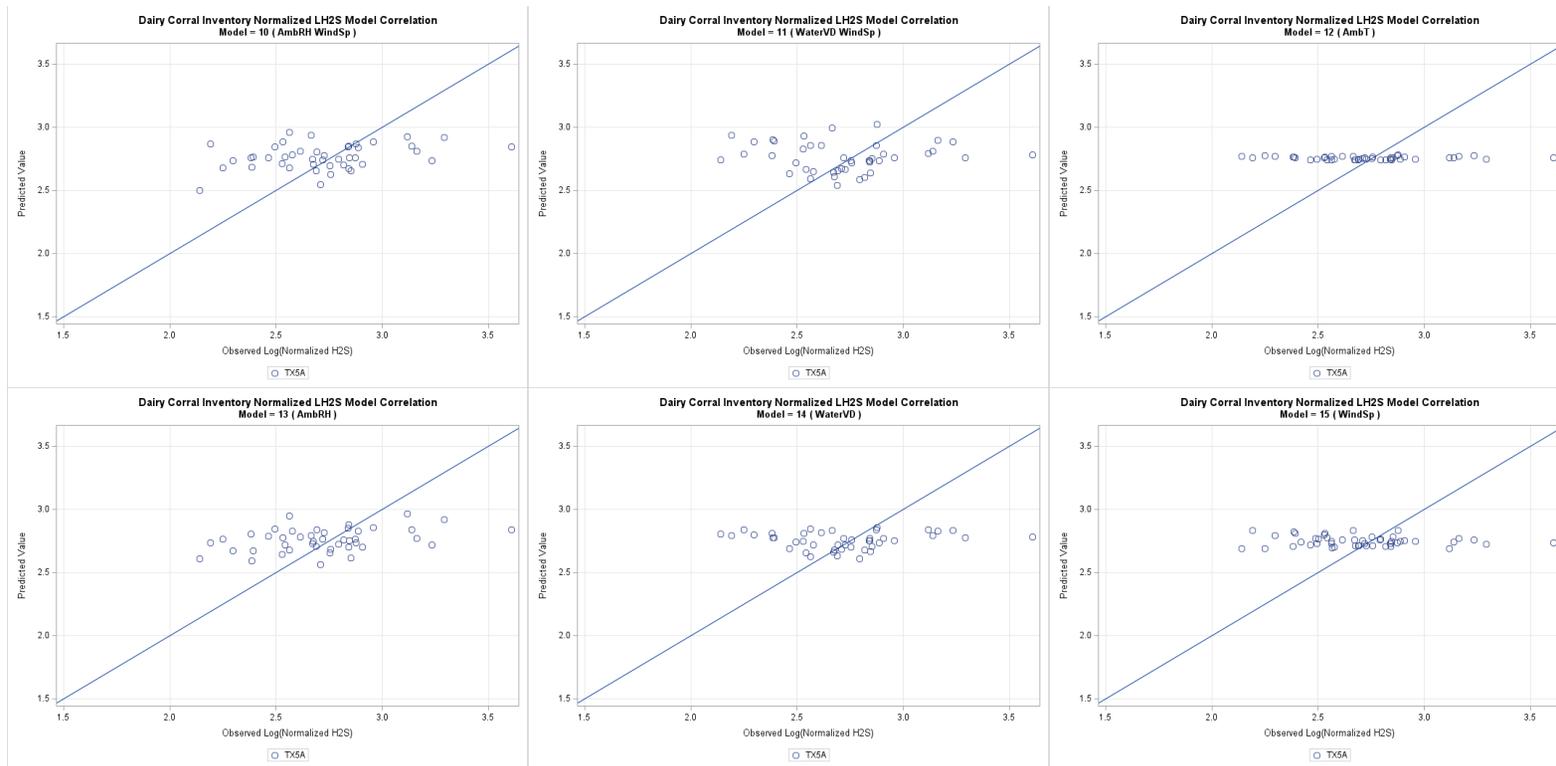


Figure G-86. Dairy corral H₂S one-to-one plots models 10b through 15b, log transformed.

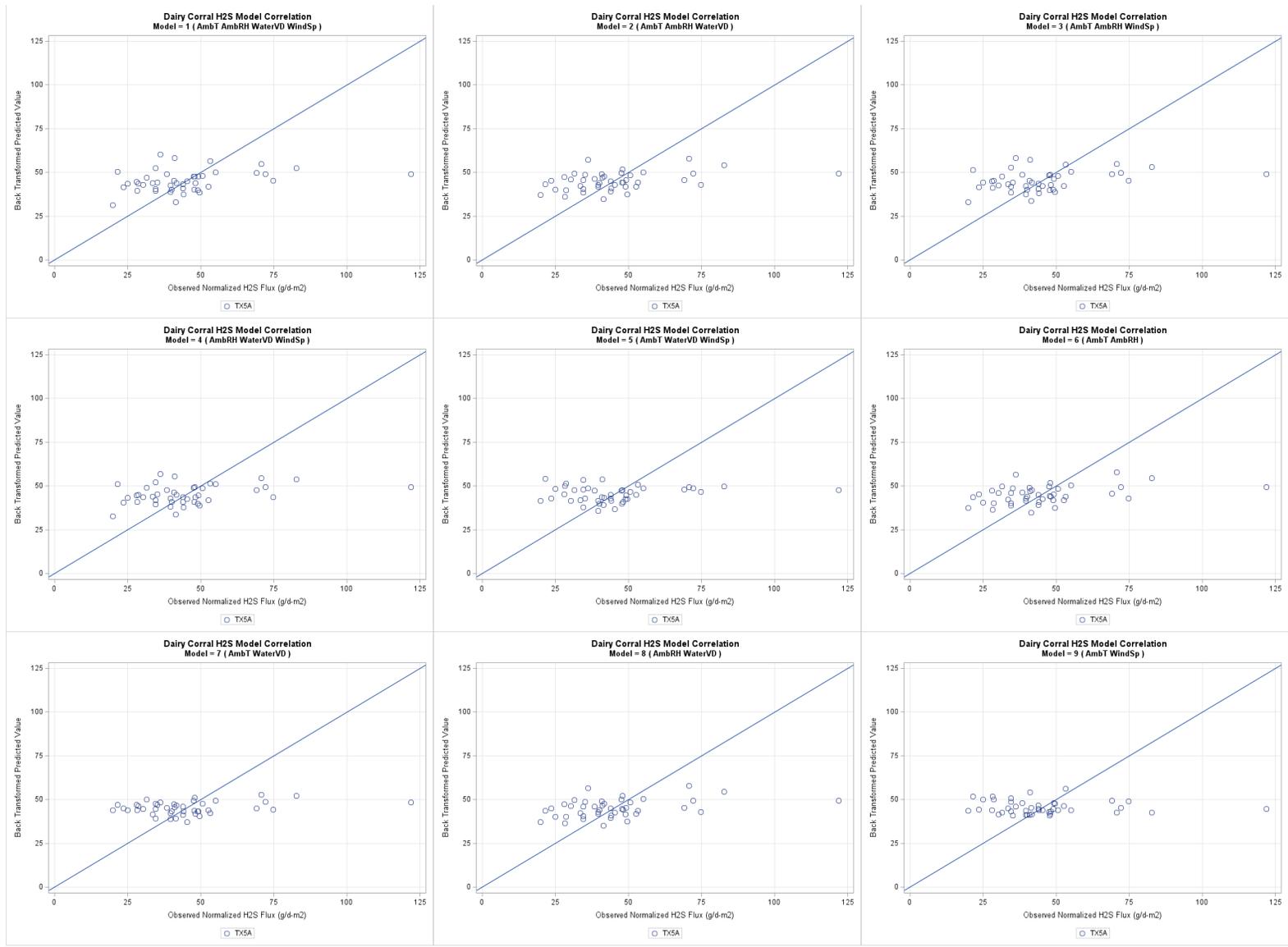


Figure G-87. Dairy corral H₂S one-to-one plots models 1a through 9a, back transformed.

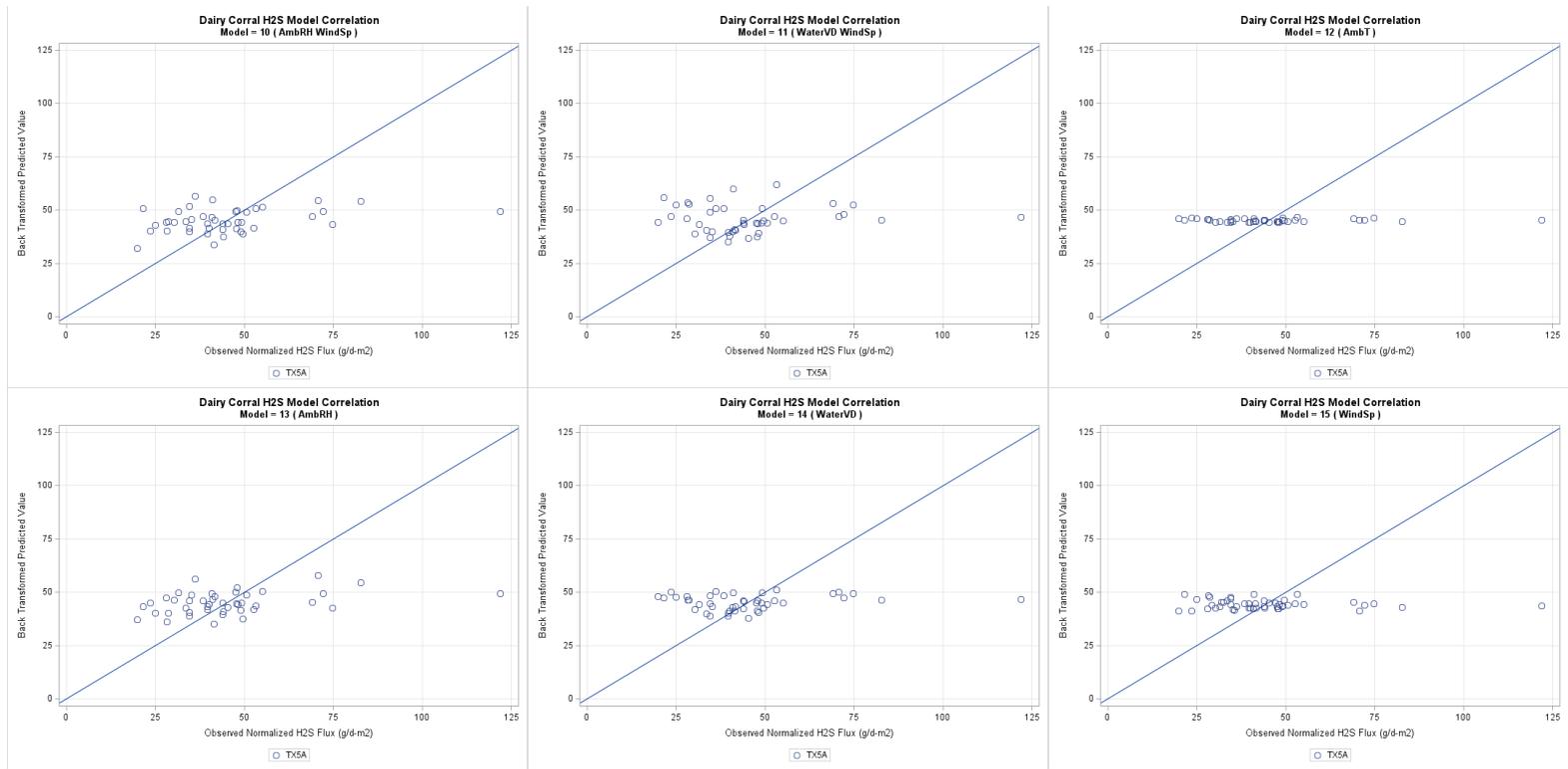


Figure G-88. Dairy corral H₂S one-to-one plots models 10a through 15a, back transformed.

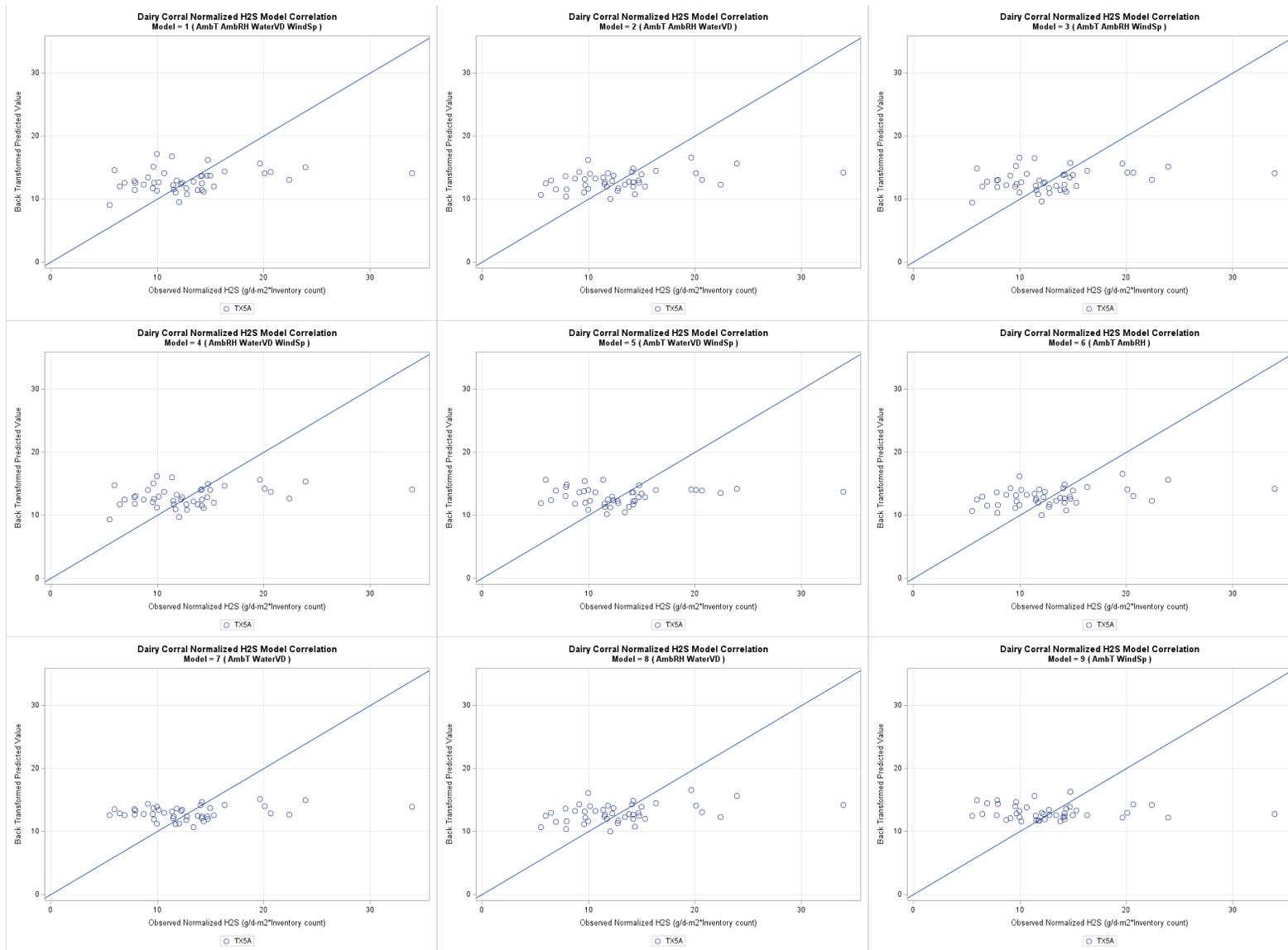


Figure G-89. Dairy corral H₂S one-to-one plots models 1b through 9b, back transformed.

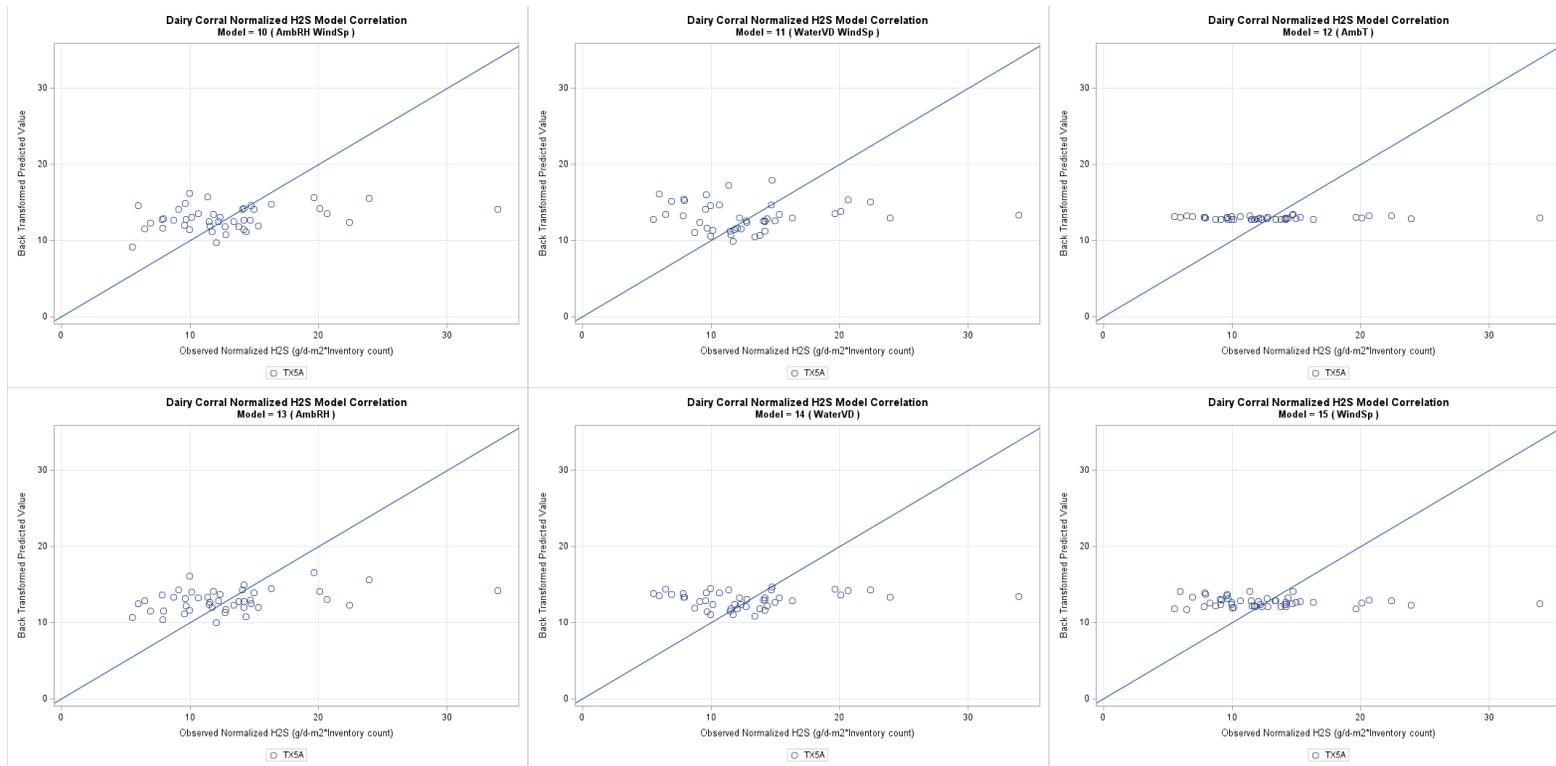


Figure G-90. Dairy corral H₂S one-to-one plots models 10b through 15b, back transformed.