|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | 0.0082  (0.0075) | 0.0120  (0.0078) | 0.0089  (0.0075) | 0.0126  (0.0079) | 0.0084  (0.0075) | 0.0076  (0.0076) |
| Soy | -0.0123  (0.0082) | -0.0097  (0.0083) | -0.0111  (0.0082) | -0.0089  (0.0084) | -0.0101  (0.0083) | -0.0122  (0.0082) |
| Cotton | -0.0128  (0.0226) | -0.0112  (0.0225) | -0.0134  (0.0226) | -0.0018  (0.0233) | -0.0034  (0.0232) | -0.0138  (0.0227) |
| Canola | 0.0190  (0.0583) | 0.0204  (0.0582) | 0.0182  (0.0583) | 0.0208  (0.0586) | 0.0260  (0.0584) | 0.0187  (0.0584) |
| Sorghum | -0.0163  (0.0400) | -0.0129  (0.0399) | -0.0140  (0.0400) | -0.0128  (0.0402) | -0.0307  (0.0404) | -0.0156  (0.0400) |
| Rice | -0.0014  (0.0140) | 0.0010  (0.0140) | -0.0011  (0.0140) | 0.0018  (0.0141) | 0.0025  (0.0141) | -0.0013  (0.0140) |
| Barley | 0.1284\*\*  (0.0654) | 0.1357\*\*  (0.0654) | 0.1311\*\*  (0.0654) | 0.1350\*\*  (0.0658) | 0.1291\*\*  (0.0654) | 0.1278\*  (0.0654) |
| Spring wheat | -0.0306  (0.0205) | -0.0257  (0.0206) | -0.0273  (0.0206) | -0.0246  (0.0207) | -0.0413\*\*  (0.0209) | -0.0308  (0.0205) |
| Winter wheat | -0.0025  (0.0190) | 0.0063  (0.0196) | -0.0000  (0.0191) | 0.0073  (0.0200) | 0.0072  (0.0197) | -0.0031  (0.0191) |
| Natural |  | 0.0049\*  (0.0029) |  |  |  |  |
| Natural during bloom |  |  | 0.0029  (0.0023) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000\*\*  (0.0000) |  |  |
| ndvi |  |  |  |  | 0.0111\*\*\*  (0.0039) |  |
| NDVI in bloom |  |  |  |  |  | 0.0003  (0.0007) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1954 | 0.2008 | 0.1984 | 0.2081 | 0.2135 | 0.1958 |

Nosema OLS Full Crop Models with Percentage and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | 0.0091  (0.0096) | 0.0126  (0.0079) | 0.0098  (0.0076) | 0.0134\*  (0.0079) | 0.0093  (0.0075) | 0.0080  (0.0077) |
| Soy | -0.0140  (0.0086) | -0.0120  (0.0087) | -0.0130  (0.0087) | -0.0113  (0.0087) | -0.0091  (0.0086) | -0.0138  (0.0086) |
| Cotton | -0.0026  (0.0224) | -0.0012  (0.0224) | -0.0030  (0.0224) | 0.0055  (0.0229) | 0.0077  (0.0226) | -0.0041  (0.0225) |
| Canola | 0.0107  (0.0575) | 0.0113  (0.0574) | 0.0102  (0.0575) | 0.0114  (0.0574) | 0.0182  (0.0566) | 0.0103  (0.0575) |
| Sorghum | -0.0093  (0.0395) | -0.0056  (0.0395) | -0.0074  (0.0396) | -0.0058  (0.0395) | -0.0263  (0.0391) | -0.0076  (0.0396) |
| Rice | 0.0183  (0.0274) | 0.0241  (0.0276) | 0.0193  (0.0274) | 0.0252  (0.0276) | 0.0207  (0.0270) | 0.0204  (0.0275) |
| Barley | 01173\*  (0.0645) | 0.1230\*  (0.0645) | 0.1195\*  (0.0645) | 0.1244\*  (0.0644) | 0.1159\*  (0.0635) | 0.1160\*  (0.0645) |
| Spring wheat | -0.0237  (0.0204) | -0.0189  (0.0206) | -0.0210  (0.0205) | -0.0182  (0.0205) | -0.0388\*  (0.0635) | -0.0242  (0.0204) |
| Winter wheat | -0.0128  (0.0193) | -0.0052  (0.0200) | -0.0103  (0.0195) | -0.0036  (0.0199) | -0.0036  (0.0192) | -0.0141  (0.0194) |
| Average temperature | -0.0383\*\*\*  (0.0132) | -0.0377\*\*\*  (0.0132) | -0.0381\*\*\*  (0.0132) | -0.0388\*\*\*  (0.0133) | -0.0625\*\*\*  (0.0145) | -0.0389\*\*\*  (0.1323) |
| Average precipitation | 0.0006  (0.0009) | 0.0004  (0.0009) | 0.0007  (0.0009) | 0.0003  (0.0009) | -0.0003  (0.0009) | 0.0008  (0.0009) |
| Natural |  | 0.0044  (0.0029) |  |  |  |  |
| Natural in bloom |  |  | 0.0025  (0.0024) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000\*  (0.0000) |  |  |
| NDVI |  |  |  |  | 0.0172\*\*\*  (0.0044) |  |
| NDVI in bloom |  |  |  |  |  | 0.0007  (0.0007) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2222 | 0.2264 | 0.2242 | 0.2299 | 0.2509 | 0.2240 |

Nosema OLS Full Crop Models with Percentage, Forage and Weather Controls

Varroa OLS Full Crop Models with Percentage and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | -0.0125\*\*\*  (0.0035) | -0.0126\*\*\*  (0.0036) | -0.0134\*\*\*  (0.0035) | -0.0141\*\*\*  (0.0037) | -0.0145\*\*\*  (0.0036) | -0.0116\*\*\*  (0.0035) |
| Soy | 0.0089\*\*  (0.0037) | 0.0088\*\*  (0.0038) | 0.0075\*\*  (0.0037) | 0.0093\*\*  (0.0039) | 0.0087\*\*  (0.0038) | 0.0086\*\*  (0.0037) |
| Cotton | -0.0158\*\*  (0.0061) | -0.0159\*\*  (0.0062) | -0.0159\*\*  (0.0061) | -0.0170\*\*\*  (0.0065) | -0.0171\*\*\*  (0.0065) | -0.0151\*\*  (0.0061) |
| Canola | -0.0581  (0.0355) | -0.0581  (0.0356) | -0.0588\*  (0.0354) | -0.0603\*  (0.0358) | -0.0603\*  (0.0357) | -0.0570  (0.0354) |
| Sorghum | -0.0244  (0.0172) | -0.0245  (0.0173) | -0.0252  (0.0172) | -0.0287\*  (0.01174) | -0.0268  (0.0174) | -0.0240  (0.0172) |
| Rice | 0.0022  (0.0083) | 0.0021  (0.0083) | 0.0021  (0.0083) | 0.0013  (0.0083) | 0.0002  (0.0083) | 0.0019  (0.0083) |
| Barley | -0.0694\*  (0.0376) | -0.0697\*  (0.0377) | -0.0743\*  (0.0375) | -0.0711\*  (0.0379) | -0.0712\*  (0.0378) | -0.0677\*  (0.0376) |
| Spring wheat | -0.0030  (0.0107) | -0.0032  (0.0107) | -0.0053  (0.0106) | -0.0027  (0.0108) | 0.0012  (0.0109) | -0.0024  (0.0106) |
| Winter wheat | 0.0016  (0.0086) | 0.0014  (0.0088) | 0.0001  (0.0086) | 0.0084  (0.0096) | 0.0052  (0.0095) | 0.0032  (0.0086) |
| Natural |  | -0.0001  (0.0013) |  |  |  |  |
| Natural during bloom |  |  | -0.0032\*\*\*  (0.0011) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000  (0.0000) |  |  |
| ndvi |  |  |  |  | -0.0042\*\*  (0.0018) |  |
| NDVI in bloom |  |  |  |  |  | -0.0007\*\*  (0.0003) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1797 | 0.1797 | 0.1872 | 0.1831 | 0.1882 | 0.1842 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | -0.0135\*\*\*  (0.0036) | -0.0136\*\*\*  (0.0038) | -0.0144\*\*\*  (0.0036) | -0.0140\*\*\*  (0.0038) | -0.0141\*\*\*  (0.0037) | -0.0125\*\*\*  (0.0037) |
| Soy | 0.0098\*\*  (0.0040) | 0.0098\*\*  (0.0041) | 0.0084\*\*  (0.0040) | 0.0098\*\*  (0.0041) | 0.0091\*\*  (0.0041) | 0.0095\*\*  (0.0040) |
| Cotton | -0.0147\*\*  (0.0062) | -0.0147\*\*  (0.0062) | -0.0148\*\*  (0.0062) | -0.0156\*\*  (0.0065) | -0.0158\*\*  (0.0065) | -0.0144\*\*  (0.0062) |
| Canola | -0.0636\*  (0.0356) | -0.0636\*  (0.0356) | -0.0641\*  (0.0354) | -0.0637\*  (0.0356) | -0.0634\*  (0.0355) | -0.0635\*  (0.0355) |
| Sorghum | -0.0237  (0.0173) | -0.0237  (0.0174) | -0.0248  (0.0173) | -0.0241  (0.0174) | -0.0235  (0.0174) | -0.0240  (0.0173) |
| Rice | 0.0044  (0.0142) | 0.0044  (0.0142) | 0.0046  (0.0141) | 0.0042  (0.0143) | 0.0045  (0.0142) | 0.0027  (0.0142) |
| Barley | -0.0736\*  (0.0377) | -0.0738\*  (0.0378) | -0.0783\*\*  (0.0376) | -0.0741\*\*  (0.0378) | -0.0734\*  (0.0377) | -0.0731\*  (0.0376) |
| Spring wheat | 0.0015  (0.0108) | 0.0015  (0.0109) | -0.0007  (0.0108) | 0.0014  (0.0109) | 0.0038  (0.0109) | 0.0028  (0.0108) |
| Winter wheat | 0.0050  (0.0094) | 0.0049  (0.0097) | 0.0031  (0.0094) | 0.0048  (0.0096) | 0.0034  (0.0095) | 0.0073  (0.0095) |
| Average temperature | -0.0150\*\*\*  (0.0055) | -0.0150\*\*\*  (0.0055) | -0.0144\*\*\*  (0.0055) | -0.0146\*\*\*  (0.0056) | -0.0110\*  (0.0060) | -0.0141\*\*  (0.0055) |
| Average precipitation | -0.0002  (0.0004) | -0.0002  (0.0004) | -0.0004  (0.0004) | -0.0002  (0.0004) | -0.0001  (0.0004) | -0.0004  (0.0004) |
| Natural |  | -0.0001  (0.0014) |  |  |  |  |
| Natural in bloom |  |  | -0.0031\*\*\*  (0.0011) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000  (0.0000) |  |  |
| NDVI |  |  |  |  | -0.0032  (0.0020) |  |
| NDVI in bloom |  |  |  |  |  | -0.0007\*\*  (0.0003) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1979 | 0.1979 | 0.2050 | 0.1999 | 0.2023 | 0.2021 |

Varroa OLS Full Crop Models with Percentage, Forage and Weather Controls

Nosema OLS Full Crop Models with Natural Log and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | -0.0189  (0.0390) | -0.0172  (0.0392) | -0.0201  (0.0391) | -0.0128  (0.0395) | -0.0191  (0.0393) | -0.0178  (0.0398) |
| Soy | 0.0083  (0.0284) | 0.0086  (0.0284) | 0.0068  (0.0285) | 0.0071  (0.0288) | 0.0061  (0.0287) | 0.0044  (0.0290) |
| Cotton | -0.0394  (0.0376) | -0.0405  (0.0377) | -0.0431  (0.0379) | -0.0312  (0.0388) | -0.0265  (0.0386) | -0.0323  (0.0392) |
| Canola | 0.0553  (0.0608) | 0.0580  (0.0611) | 0.0556  (0.0608) | 0.0624  (0.0613) | 0.0509  (0.0611) | 0.0583  (0.0616) |
| Sorghum | 0.0078  (0.0447) | 0.0084  (0.0448) | 0.0110  (0.0449) | 0.0018  (0.0454) | -0.0038  (0.0453) | 0.0072  (0.0457) |
| Rice | -0.0740  (0.0514) | -0.0692  (0.0525) | -0.0687  (0.0518) | -0.0614  (0.0522) | -0.0788  (0.0518) | -0.0677  (0.0525) |
| Barley | 0.0405  (0.0502) | 0.0386  (0.0504) | 0.0377  (0.0503) | 0.0300  (0.0516) | 0.0363  (0.0514) | 0.0326  (0.0519) |
| Spring wheat | -0.0904\*  (0.0483) | -0.0873\*  (0.0488) | -0.0874\*  (0.0484) | -0.0905\*  (0.0486) | -0.1133\*\*  (0.0491) | -0.0875\*  (0.0489) |
| Winter wheat | -0.0222  (0.0270) | -0.0204  (0.0273) | -0.0236  (0.0271) | -0.0131  (0.0280) | -0.0118  (0.0279) | -0.0254  (0.0278) |
| Natural |  | 0.0249  (0.0527) |  |  |  |  |
| Natural during bloom |  |  | 0.0081  (0.0095) |  |  |  |
| Natural\*ndvi |  |  |  | 00003\*\*  (0.0002) |  |  |
| ndvi |  |  |  |  | 0.0112\*\*\*  (0.0038) |  |
| NDVI in bloom |  |  |  |  |  | 0.0178  (0.0292) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1974 | 0.1978 | 0.1987 | 0.2092 | 0.2153 | 0.2006 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | -0.0208  (0.0394) | -0.0195  (0.0396) | -0.0221  (0.0395) | -0.0193  (0.0392) | -0.0309  (0.0389) | -0.0223  (0.0397) |
| Soy | 0.0097  (0.0294) | 0.0103  (0.0294) | 0.0081  (0.0295) | 0.0197  (0.0294) | 0.0236  (0.0291) | 0.0099  (0.0295) |
| Cotton | -0.0151  (0.0379) | -0.0162  (0.0380) | -0.0184  (0.0382) | -0.0108  (0.0382) | 0.0001  (0.0379) | -0.0131  (0.0388) |
| Canola | 0.0496  (0.0604) | 0.0519  (0.0607) | 0.0498  (0.0604) | 0.0554  (0.0600) | 0.0396  (0.0594) | 0.0490  (0.0605) |
| Sorghum | 0.0236  (0.0450) | 0.0243  (0.0451) | 0.0268  (0.0452) | 0.0241  (0.0448) | 0.0203  (0.0443) | 0.0258  (0.0454) |
| Rice | -0.0469  (0.0554) | -0.0425  (0.0565) | -0.0416  (0.0559) | -0.0342  (0.0553) | -0.0597  (0.0545) | -0.0437  (0.0559) |
| Barley | 0.0475  (0.0512) | 0.0459  (0.0514) | 0.0445  (0.0514) | 0.0410  (0.0510) | 0.0478  (0.0504) | 0.0460  (0.0514) |
| Spring wheat | -0.0740  (0.0480) | -0.0711  (0.0486) | -0.0711  (0.0481) | -0.0754  (0.0477) | -0.1095\*\*  (0.0480) | -0.0732  (0.0482) |
| Winter wheat | -0.0383  (0.0277) | -0.0371  (0.0279) | -0.0384  (0.0277) | -0.0299  (0.0278) | -0.0297  (0.0274) | -0.0395  (0.0278) |
| Average temperature | -0.0382\*\*\*  (0.0135) | -0.0384\*\*\*  (0.0135) | -0.0384\*\*\*  (0.0135) | -0.0492\*\*\*  (0.0141) | -0.0627\*\*\*  (0.0147) | -0.0389\*\*\*  (0.0136) |
| Average precipitation | 0.0004  (0.0009) | 0.0004  (0.0009) | 0.0006  (0.0010) | -0.0002  (0.0010) | -0.0006  (0.0010) | 0.0006  (0.0010) |
| Natural |  | 0.0215  (0.0534) |  |  |  |  |
| Natural in bloom |  |  | 0.0071  (0.0100) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0005\*\*\*  (0.0002) |  |  |
| NDVI |  |  |  |  | 0.0173\*\*\*  (0.0043) |  |
| NDVI in bloom |  |  |  |  |  | 0.0199  (0.0302) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2205 | 0.2208 | 0.2214 | 0.2346 | 0.2503 | 0.2217 |

Nosema OLS Full Crop Models with Natural Log, Forage and Weather Controls

Varroa OLS Full Crop Models with Natural Log and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | -0.0346\*\*  (0.1651) | -0.0354\*\*  (0.0165) | -0.0342\*\*  (0.0165) | -0.0388\*\*  (0.0169) | -0.0371\*\*  (0.0170) | -0.0381\*\*  (0.0169) |
| Soy | -0.0078  (0.0127) | -0.0090  (0.0127) | -0.0070  (0.0126) | -0.0082  (0.0130) | -0.0069  (0.0130) | -0.0055  (0.0130) |
| Cotton | -0.0321\*\*  (0.0139) | -0.0318\*\*  (0.0139) | -0.0276\*\*  (0.0140) | -0.0324\*\*  (0.0145) | -0.0334\*\*  (0.0146) | -0.0287\*  (0.0147) |
| Canola | -0.0279  (0.0317) | -0.0315  (0.0319) | -0.0289  (0.0317) | -0.0253  (0.0324) | -0.0190  (0.0325) | -0.0240  (0.0324) |
| Sorghum | -0.0084  (0.0189) | -0.0092  (0.0189) | -0.0100  (0.0189) | -0.0101  (0.0193) | -0.0088  (0.0194) | -0.0112  (0.0194) |
| Rice | 0.0393\*  (0.0229) | 0.0373  (0.0230) | 0.0315  (0.0231) | 0.0358  (0.0234) | 0.0384\*  (0.0234) | 0.0316  (0.0236) |
| Barley | -0.0297  (0.0246) | -0.0278  (0.0246) | -0.0284  (0.0245) | -0.0255  (0.0255) | -0.0272  (0.0254) | -0.0274  (0.0254) |
| Spring wheat | -0.0260  (0.0248) | -0.0282  (0.0249) | -0.0274  (0.0247) | -0.0294  (0.0252) | -0.0250  (0.0253) | -0.0300  (0.0252) |
| Winter wheat | 0.0200  (0.0124) | 0.0184  (0.0125) | 0.0239\*  (0.0125) | 0.0178  (0.0130) | 0.0175  (0.0131) | 0.0249\*  (0.0129) |
| Natural |  | -0.0260  (0.0218) |  |  |  |  |
| Natural during bloom |  |  | -0.0106\*\*  (0.0042) |  |  |  |
| Natural\*ndvi |  |  |  | -0.0001\*  (0.0001) |  |  |
| ndvi |  |  |  |  | -0.0033\*  (0.0018) |  |
| NDVI in bloom |  |  |  |  |  | -0.0222\*  (0.0131) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1817 | 0.1830 | 0.1872 | 0.1863 | 0.1862 | 0.1856 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | -0.0467\*\*\*  (0.0173) | -0.0474\*\*\*  (0.0173) | -0.0462\*\*\*  (0.0172) | -0.0479\*\*\*  (0.0173) | -0.0465\*\*\*  (0.0174) | -0.0479\*\*\*  (0.0173) |
| Soy | 0.0014  (0.0134) | -0.0001  (0.0135) | 0.0025  (0.0134) | -0.0010  (0.0136) | -0.0000  (0.0136) | 0.0030  (0.0135) |
| Cotton | -0.0280\*  (0.0146) | -0.0278\*  (0.0146) | -0.0239  (0.0147) | -0.0284\*  (0.0149) | -0.0293\*\*  (0.0149) | -0.0242  (0.0150) |
| Canola | -0.0270  (0.0323) | -0.0308  (0.0325) | -0.0277  (0.0323) | -0.0278  (0.0324) | -0.0228  (0.0326) | -0.0266  (0.0324) |
| Sorghum | -0.0018  (0.0196) | -0.0026  (0.0196) | -0.0039  (0.0196) | -0.0031  (0.0197) | -0.0026  (0.0197) | -0.0036  (0.0198) |
| Rice | 0.0470\*  (0.0248) | 0.0452\*  (0.0249) | 0.0390  (0.0251) | 0.0460\*  (0.0250) | 0.0480\*  (0.0250) | 0.0400  (0.0253) |
| Barley | -0.0230  (0.0254) | -0.0211  (0.0255) | -0.0209  (0.0254) | -0.0211  (0.0256) | -0.0228  (0.0256) | -0.0217  (0.0256) |
| Spring wheat | -0.0226  (0.0252) | -0.0245  (0.0252) | -0.0239  (0.0251) | -0.0220  (0.0252) | -0.0187  (0.0253) | -0.0224  (0.0252) |
| Winter wheat | 0.0201  (0.0130) | 0.0188  (0.0131) | 0.0221\*  (0.0130) | 0.0168  (0.0132) | 0.0171  (0.0132) | 0.0216  (0.0132) |
| Average temperature | -0.0142\*\*  (0.0056) | -0.0142\*\*  (0.0056) | -0.0134\*\*  (0.0056) | -0.0119\*\*  (0.0058) | -0.0109\*  (0.0061) | -0.0132\*\*  (0.0057) |
| Average precipitation | -0.0000  (0.0004) | 0.0000  (0.0004) | -0.0002\*  (0.0004) | 0.0001  (0.0004) | 0.0001  (0.0005) | -0.0002  (0.0004) |
| Natural |  | -0.0246  (0.0226) |  |  |  |  |
| Natural in bloom |  |  | -0.0089\*  (0.0045) |  |  |  |
| Natural\*ndvi |  |  |  | -0.0001  (0.0001) |  |  |
| NDVI |  |  |  |  | -0.0027  (0.0020) |  |
| NDVI in bloom |  |  |  |  |  | -0.0210  (0.0137) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1969 | 0.1980 | 0.2005 | 0.2006 | 0.2000 | 0.2006 |

Varroa OLS Full Crop Models with Natural Log, Forage and Weather Controls

**Nosema and Corn**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerCorn | 0.0015  (0.0057) | 0.0075  (0.0063) | 0.0033  (0.0057) | 0.0085  (0.0064) | 0.0024  (0.0058) | 0.0011  (0.0058) |
| PerCorn planting | -0.0174  (0.0150) | -0.0189  (0.0149) | -0.0169  (0.0149) | -0.0161  (0.0150) | -0.0090  (0.0155) | -0.0168  (0.0151) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1809 | 0.1890 | 0.1856 | 0.1971 | 0.1953 | 0.1811 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerCorn | 0.0021  (0.0056) | 0.0074  (0.0063) | 0.0038  (0.0057) | 0.0085  (0.0063) | 0.0045  (0.0056) | 0.0012  (0.0058) |
| PerCorn planting | -0.0235  (0.0149) | -0.0228  (0.0148) | -0.0232  (0.0149) | -0.0220  (0.0148) | -0.0112  (0.0151) | -0.0222  (0.0150) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2110 | 0.2176 | 0.2146 | 0.2211 | 0.2350 | 0.2121 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnCorn | -0.0418\*  (0.0238) | -0.0358  (0.0247) | -0.0453\*  (0.0240) | -0.0306  (0.0195) | -0.0415\*  (0.0242) | -0.0446\*  (0.0247) |
| lnCorn planting | 0.0123  (0.0177) | 0.0123  (0.0177) | 0.0139  (0.0178) | 0.0195  (0.0181) | 0.0248  (0.0184) | 0.0137  (0.0181) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1849 | 0.1864 | 0.1870 | 0.2005 | 0.2033 | 0.1900 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnCorn | -0.0368  (0.0242) | -0.0319  (0.0250) | -0.0394  (0.0243) | -0.0209  (0.0246) | -0.0324  (0.0239) | -0.0381  (0.0247) |
| lnCorn planting | -0.0100  (0.0185) | -0.0099  (0.0185) | -0.0084  (0.0186) | -0.0033  (0.0185) | 0.0042  (0.0187) | -0.0084  (0.0187) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2111 | 0.2122 | 0.2124 | 0.2260 | 0.2366 | 0.2123 |

**Varroa and Corn**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerCorn | -0.0072\*\*\*  (0.0026) | -0.0070\*\*  (0.0029) | -0.0088\*\*\*  (0.0027) | -0.0077\*\*  (0.0030) | -0.0086\*\*\*  (0.0027) | -0.0061\*\*  (0.0027) |
| PerCorn planting | 0.0081  (0.0069) | 0.0081  (0.0069) | 0.0076  (0.0069) | 0.0030  (0.0081) | -0.0013  (0.0082) | 0.0062  (0.0070) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1583 | 0.1583 | 0.1651 | 0.1578 | 0.1656 | 0.1640 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerCorn | -0.0067\*\*  (0.0027) | -0.0067\*\*  (0.0030) | -0.0085\*\*\*  (0.0028) | -0.0073\*\*  (0.0030) | -0.0081\*\*\*  (0.0027) | -0.0057\*\*  (0.0027) |
| PerCorn planting | 0.0016  (0.0081) | 0.0016  (0.0081) | 0.0012  (0.0081) | 0.0019  (0.0081) | -0.0012  (0.0082) | 0.0000  (0.0081) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1733 | 0.1733 | 0.1803 | 0.1748 | 0.1789 | 0.1789 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnCorn | -0.0413\*\*\*  (0.0103) | -0.0441\*\*\*  (0.0106) | -0.0383\*\*\*  (0.0104) | -0.0480\*\*\*  (0.0108) | -0.0443\*\*\*  (0.0107) | -0.0404\*\*\*  (0.0108) |
| lnCorn planting | -0.0021  (0.0082) | -0.0021  (0.0082) | -0.0024  (0.0082) | -0.0069  (0.0084) | -0.0088  (0.0085) | -0.0053  (0.0084) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1654 | 0.1665 | 0.1720 | 0.1713 | 0.1728 | 0.1702 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnCorn | -0.0416\*\*\*  (0.0108) | -0.0444\*\*\*  (0.0111) | -0.0388\*\*\*  (0.0108) | -0.0473\*\*\*  (0.0110) | -0.0443\*\*\*  (0.0108) | -0.0398\*\*\*  (0.0110) |
| lnCorn planting | -0.0139  (0.0089) | -0.0138  (0.0089) | -0.0140  (0.0089) | -0.0153\*  (0.0089) | -0.0161\*  (0.0090) | -0.0144  (0.0089) |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1838 | 0.1850 | 0.1892 | 0.1892 | 0.1893 | 0.1896 |

**Nosema and Soy**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerSoy | -0.0087  (0.0062) | -0.0046  (0.0069) | -0.0066  (0.0064) | -0.0035  (0.0070) | -0.0075  (0.0063) | -0.0090  (0.0062) |
| PerSoy planting | -0.0030  (0.0152) | -0.0037  (0.0152) | -0.0042  (0.0152) | -0.0039  (0.0153) | -0.0012  (0.0153) | -0.0037  (0.0152) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1829 | 0.1860 | 0.1858 | 0.1933 | 0.1975 | 0.1836 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerSoy | -0.0083  (0.0061) | -0.0046  (0.0069) | -0.0065  (0.0064) | -0.0036  (0.0069) | -0.0054  (0.0061) | -0.0087  (0.0061) |
| PerSoy planting | 0.0001  (0.0151) | -0.0005  (0.0151) | -0.0012  (0.0152) | -0.0000  (0.0152) | 0.0077  (0.0151) | -0.0012  (0.0152) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2101 | 0.2126 | 0.2121 | 0.2153 | 0.2347 | 0.2122 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnSoy | -0.0232  (0.0190) | -0.0173  (0.0198) | -0.0247  (0.0191) | -0.0170  (0.0197) | -0.0271  (0.0194) | -0.0263  (0.0196) |
| lnSoy planting | 0.0026  (0.0178) | 0.0005  (0.0179) | 0.0020  (0.0178) | -0.0004  (0.0181) | 0.0032  (0.0180) | 0.0029  (0.0181) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1811 | 0.1831 | 0.1825 | 0.1967 | 0.1981 | 0.1862 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnSoy | -0.0202  (0.0196) | -0.0149  (0.0206) | -0.0213  (0.0197) | -0.0042  (0.0202) | -0.0157  (0.0195) | -0.0203  (0.0199) |
| lnSoy planting | 0.0021  (0.0181) | 0.0005  (0.0182) | 0.0010  (0.0181) | 0.0006  (0.0180) | 0.0075  (0.0179) | 0.0015  (0.0181) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2083 | 0.2096 | 0.2093 | 0.2247 | 0.2345 | 0.2094 |

**Varroa and Soy**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerSoy | 0.0005  (0.0028) | 0.0026  (0.0031) | -0.0012  (0.0029) | 0.0019  (0.0032) | -0.0009  (0.0029) | 0.0009  (0.0028) |
| PerSoy planting | -0.0035  (0.0068) | -0.0038  (0.0068) | -0.0030  (0.0068) | -0.0024  (0.0071) | -0.0033  (0.0071) | -0.0030  (0.0068) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1515 | 0.1535 | 0.1560 | 0.1521 | 0.1563 | 0.1593 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerSoy | 0.0011  (0.0028) | 0.0032  (0.0032) | -0.0005  (0.0029) | 0.0029  (0.0032) | 0.0001  (0.0029) | 0.0014  (0.0028) |
| PerSoy planting | -0.0012  (0.0070) | -0.0015  (0.0070) | -0.0008  (0.0070) | -0.0013  (0.0071) | -0.0024  (0.0071) | -0.0004  (0.0070) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1674 | 0.1694 | 0.1713 | 0.1700 | 0.1704 | 0.1748 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnSoy | -0.0222\*\*\*  (0.0086) | -0.0242\*\*\*  (0.0089) | -0.0210\*\*  (0.0086) | -0.0267\*\*\*  (0.0091) | -0.0235\*\*\*  (0.0089) | -0.0212\*\*  (0.0089) |
| lnSoy planting | -0.0066  (0.0082) | -0.0061  (0.0082) | -0.0056  (0.0082) | -0.0040  (0.0084) | -0.0050  (0.0084) | -0.0049  (0.0084) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1584 | 0.1590 | 0.1662 | 0.1615 | 0.1633 | 0.1629 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnSoy | -0.0180\*\*  (0.0090) | -0.0200\*\*  (0.0094) | -0.0167\*  (0.0090) | -0.0224\*\*  (0.0094) | -0.0201\*\*  (0.0091) | -0.0167\*  (0.0091) |
| lnSoy planting | -0.0052  (0.0084) | -0.0047  (0.0085) | -0.0041  (0.0084) | -0.0043  (0.0085) | -0.0054  (0.0084) | -0.0044  (0.0084) |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1718 | 0.1724 | 0.1784 | 0.1752 | 0.1757 | 0.1782 |

**Nosema and Cotton**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerCotton | -0.0128  (0.0226) | -0.0103  (0.0225) | -0.0131  (0.0225) | -0.0006  (0.0232) | -0.0031  (0.0232) | -0.0140  (0.0227) |
| PerCotton planting | -1.3488  (2.8182) | -1.4898  (2.8114) | -1.2736  (2.8136) | -1.5217  (2.8288) | -1.2913  (2.8244) | -1.3194  (2.8210) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1794 | 0.1857 | 0.1841 | 0.1931 | 0.1949 | 0.1799 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerCotton | -0.0025  (0.0224) | -0.0001  (0.0224) | -0.0026  (0.0224) | 0.0067  (0.0229) | 0.0083  (0.0226) | -0.0042  (0.0225) |
| PerCotton planting | -1.1154  (2.7754) | -1.2420  (2.7702) | -1.0542  (2.7729) | -1.2672  (2.7684) | -1.0090  (2.7248) | -1.0495  (2.7768) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2066 | 0.2120 | 0.2101 | 0.2153 | 0.2336 | 0.2082 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnCotton | -0.0462  (0.0328) | -0.0455  (0.0328) | -0.0501  (0.0330) | -0.0340  (0.0335) | -0.0350  (0.0335) | -0.0391  (0.0341) |
| lnCotton planting | 0.0682\*\*  (0.0277) | 0.0662\*\*  (0.0278) | 0.0690\*\*  (0.0277) | 0.0760\*\*\*  (0.0281) | 0.0868\*\*\*  (0.0284) | 0.0717\*\* (0.0283) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1944 | 0.1968 | 0.1963 | 0.2118 | 0.2149 | 0.1985 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnCotton | -0.0244  (0.0333) | -0.0240  (0.0333) | -0.0277  (0.0336) | -0.0159  (0.0335) | -0.0128  (0.0333) | -0.0226  (0.0341) |
| lnCotton planting | 0.0230  (0.0305) | 0.0209  (0.0306) | 0.0231  (0.0305) | 0.0276  (0.0303) | 0.0427  (0.0304) | 0.0239  (0.0306) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2085 | 0.2106 | 0.2097 | 0.2267 | 0.2372 | 0.2096 |

**Varroa and Cotton**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerCotton | -0.0159\*\*  (0.0062) | -0.0151\*\*  (0.0063) | -0.0162\*\*\*  (0.0062) | -0.0169\*\*  (0.0067) | -0.0178\*\*\*  (0.0066) | -0.0149\*\*  (0.0062) |
| PerCotton planting | 0.0159  (0.0397) | 0.0169  (0.0397) | 0.0138  (0.0396) | 0.0176  (0.0399) | 0.0124  (0.0399) | 0.0173  (0.0395) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1570 | 0.1580 | 0.1615 | 0.1578 | 0.1627 | 0.1642 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerCotton | -0.0145\*\*  (0.0063) | -0.0138\*\*  (0.0063) | -0.0149\*\*  (0.0063) | -0.0155\*\*  (0.0066) | -0.0166\*\*  (0.0066) | -0.0140\*\*  (0.0063) |
| PerCotton planting | 0.0132  (0.0397) | 0.0141  (00398) | 0.0115  (0.0397) | 0.0152  (00398) | 0.0114  (0.0398) | 0.0153  (0.0396) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1723 | 0.1730 | 0.1766 | 0.1744 | 0.1763 | 0.1792 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnCotton | -0.0454\*\*\*  (0.0126) | -0.0456\*\*\*  (0.0126) | -0.0410\*\*\*  (0.0127) | -0.0482\*\*\*  (0.0132) | -0.0482\*\*\*  (0.0132) | -0.0434\*\*\*  (0.0133) |
| lnCotton planting | -0.0001  (0.0123) | 0.0001  (0.0123) | 0.0002  (0.0123) | -0.0020  (0.0125) | -0.0050  (0.0125) | -0.0012  (0.0125) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1627 | 0.1628 | 0.1692 | 0.1652 | 0.1685 | 0.1667 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnCotton | -0.0416\*\*\*  (0.0132) | -0.0419\*\*\*  (0.0132) | -0.0373\*\*\*  (0.0133) | -0.0435\*\*\*  (0.0135) | -0.0443\*\*\*  (0.0135) | -0.0380\*\*\*  (0.0136) |
| lnCotton planting | -0.0152  (0.0138) | -0.0150  (0.0138) | -0.0135  (0.0138) | -0.0161  (0.0138) | -0.0179  (0.0138) | -0.0148  (0.0138) |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1781 | 0.1782 | 0.1831 | 0.1805 | 0.1824 | 0.1831 |

**Nosema and Canola**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerCanola | -0.0013  (0.0457) | 0.0067  (0.0458) | 0.0047  (0.0458) | 0.0077  (0.0460) | -0.0124  (0.0460) | -0.0017  (0.0458) |
| PerCanola planting | 1.0503  (1.1901) | 1.2147  (1.1892) | 1.0939  (1.1882) | 1.2383  (1.1958) | 1.2044  (1.1933) | 1.0173  (1.1937) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1798 | 0.1868 | 0.1847 | 0.1946 | 0.1965 | 0.1802 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerCanola | -0.0016  (0.0449) | 0.0058  (0.0450) | 0.0039  (0.0451) | 0.0061  (0.0449) | -0.0217  (0.0446) | -0.0025  (0.0449) |
| PerCanola planting | 0.9897  (1.1711) | 1.1348  (1.1710) | 1.0358  (1.1702) | 1.1457  (1.1699) | 1.1506  (1.1542) | 0.9258  (1.1734) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2076 | 0.2135 | 0.2113 | 0.2166 | 0.2353 | 0.2091 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnCanola | 0.0109  (0.0432) | 0.0255  (0.0446) | 0.0131  (0.0438) | 0.0181  (0.0438) | -0.0096  (0.0437) | 0.0097  (0.0436) |
| lnCanola planting | 0.0386  (0.0303) | 0.0390  (0.0303) | 0.0394  (0.0304) | 0.0454  (0.0306) | 0.0496  (0.0307) | 0.0402  (0.0307) |
| N | 477 | 465 | 468 | 449 | 460 | 460 |
| R-squared | 0.1784 | 0.1852 | 0.1807 | 0.1996 | 0.1975 | 0.1836 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnCanola | 0.0150  (0.0425) | 0.0268  (0.0440) | 0.0163  (0.0431) | 0.0234  (0.0428) | -0.0137  (0.0424) | 0.0133  (0.0426) |
| lnCanola planting | 0.0160  (0.0318) | 0.0178  (0.0318) | 0.0171  (0.0319) | 0.0241  (0.0316) | 0.0291  (0.0314) | 0.0155  (0.0318) |
| N | 448 | 437 | 439 | 434 | 445 | 445 |
| R-squared | 0.2056 | 0.2099 | 0.2075 | 0.2262 | 0.2344 | 0.2072 |

**Varroa and Canola**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerCanola | -0.0795\*\*\*  (0.0291) | -0.0770\*\*\*  (0.0292) | -0.0838\*\*\*  (0.0291) | -0.0771\*\*\*  (0.0294) | -0.0727\*\*  (0.0294) | -0.0769\*\*\*  (0.0290) |
| PerCanola planting | 0.2308  (0.3568) | 0.2498  (0.3571) | 0.2262  (0.3560) | 0.2438  (0.3594) | 0.1948  (0.3587) | 0.2853  (0.3559) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1580 | 0.1592 | 0.1629 | 0.1584 | 0.1617 | 0.1656 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerCanola | -0.0762\*\*\*  (0.0291) | -0.0740\*\*\*  (0.0292) | -0.0804\*\*\*  (0.0291) | -0.0804\*\*\*  (0.0291) | -0.0723\*\*  (0.0293) | -0.0737\*\*  (0.0290) |
| PerCanola planting | 0.2032  (0.3569) | 0.2192  (0.3574) | 0.1945  (0.3562) | 0.1945  (0.3562) | 0.1904  (0.3574) | 0.2553  (0.3562) |
| N | 885 | 885 | 885 | 885 | 875 | 885 |
| R-squared | 0.1739 | 0.1747 | 0.1785 | 0.1785 | 0.1762 | 0.1808 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnCanola | -0.0583\*\*  (0.0250) | -0.0624\*\*  (0.0254) | -0.0585\*\*  (0.0252) | -0.0596\*\*  (0.0254) | -0.0484\*  (0.0258) | -0.0544\*\*  (0.0255) |
| lnCanola planting | 0.0137  (0.0143) | 0.0115  (0.0142) | 0.0156  (0.0143) | 0.0084  (0.0145) | 0.0090  (0.0147) | 0.0133  (0.0147) |
| N | 994 | 963 | 979 | 908 | 931 | 931 |
| R-squared | 0.1495 | 0.1573 | 0.1550 | 0.1581 | 0.1495 | 0.1487 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnCanola | -0.0508\*\*  (0.0253) | -0.0556\*\*  (0.0257) | -0.0507\*\*  (0.0255) | -0.0540\*\*  (0.0253) | -0.0461\*  (0.0257) | -0.0479\*  (0.0254) |
| lnCanola planting | -0.0023  (0.0154) | -0.0031  (0.0153) | 0.0005  (0.0154) | -0.0041  (0.0153) | -0.0039  (0.0155) | -0.0004  (0.0155) |
| N | 910 | 885 | 899 | 875 | 898 | 898 |
| R-squared | 0.1633 | 0.1718 | 0.1684 | 0.1734 | 0.1649 | 0.1667 |

**Nosema and Sorghum**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerSorghum | -0.0547  (0.0479) | -0.0470  (0.0480) | -0.0490  (0.0480) | -0.0463  (0.0482) | -0.0650  (0.0482) | -0.0536  (0.0480) |
| PerSorghum planting | 0.0935  (0.0822) | 0.0881  (0.0820) | 0.0084  (0.0821) | 0.0875  (0.0825) | 0.1028  (0.0824) | 0.0920  (0.0824) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1814 | 0.1873 | 0.1856 | 0.1950 | 0.1985 | 0.1817 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerSorghum | -0.0487  (0.0473) | -0.0412  (0.0474) | -0.0438  (0.0474) | -0.0411  (0.0473) | -0.0606  (0.0467) | -0.0462  (0.0474) |
| PerSorghum planting | 0.0847  (0.0809) | 0.0795  (0.0808) | 0.0801  (0.0809) | 0.0796  (0.0807) | 0.0945  (0.0797) | 0.0810  (0.0810) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2088 | 0.2137 | 0.2120 | 0.2168 | 0.2367 | 0.2102 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnSorghum | -0.0470  (0.0393) | -0.0402  (0.0399) | -0.0462  (0.0393) | -0.0409  (0.0398) | -0.0541  (0.0396) | -0.0485  (0.0399) |
| lnSorghum planting | 0.0505\*\*  (0.0252) | 0.0475\*  (0.0254) | 0.0511\*\*  (0.0252) | 0.0496\*  (0.0253) | 0.0580\*\*  (0.0254) | 0.0523\*\*  (0.0255) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1875 | 0.1892 | 0.1887 | 0.2036 | 0.2064 | 0.1926 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnSorghum | -0.0181  (0.0400) | -0.0110  (0.0407) | -0.0167  (0.0401) | -0.0026  (0.0400) | -0.0162  (0.0395) | -0.0166  (0.0401) |
| lnSorghum planting | 0.0150  (0.0267) | 0.0116  (0.0269) | 0.0151  (0.0267) | 0.0118  (0.0265) | 0.0248  (0.0264) | 0.0156  (0.0268) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2071 | 0.2091 | 0.2080 | 0.2250 | 0.2349 | 0.2083 |

**Varroa and Sorghum**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerSorghum | -0.0315  (0.0226) | -0.0287  (0.0227) | -0.0340  (0.0225) | -0.0317  (0.0229) | -0.0337  (0.0227) | -0.0318  (0.0225) |
| PerSorghum planting | 0.0302  (0.0347) | 0.0274  (0.0348) | 0.0339  (0.0347) | 0.0311  (0.0350) | 0.0335  (0.0349) | 0.0329  (0.0346) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1530 | 0.1543 | 0.1575 | 0.1536 | 0.1579 | 0.1609 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerSorghum | -0.0292  (0.0227) | -0.0268  (0.0228) | -0.0321  (0.0227) | -0.0275  (0.0228) | -0.0299  (0.0227) | -0.0304  (0.0226) |
| PerSorghum planting | 0.0306  (0.0348) | 0.0282  (0.0349) | 0.0345  (0.0347) | 0.0287  (0.0349) | 0.0312  (0.0348) | 0.0334  (0.0346) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1689 | 0.1698 | 0.1732 | 0.1706 | 0.1719 | 0.1763 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnSorghum | -0.0244  (0.0168) | -0.0253  (0.0170) | -0.0231  (0.0168) | -0.0290\*  (0.0173) | -0.0264  (0.0172) | -0.0244  (0.0172) |
| lnSorghum planting | -0.0038  (0.0124) | -0.0034  (0.0124) | -0.0033  (0.0123) | -0.0032  (0.0124) | -0.0059  (0.0125) | -0.0039  (0.0125) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1534 | 0.1535 | 0.1619 | 0.1554 | 0.1585 | 0.1589 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnSorghum | -0.0129  (0.0175) | -0.0135  (0.0177) | -0.0135  (0.0174) | -0.0164  (0.0177) | -0.0157  (0.0176) | -0.0133  (0.0175) |
| lnSorghum planting | -0.0178  (0.0133) | -0.0175  (0.0134) | -0.0161  (0.0133) | -0.0171  (0.0133) | -0.0189  (0.0133) | -0.0170  (0.0133) |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1698 | 0.1699 | 0.1769 | 0.1718 | 0.1734 | 0.1769 |

**Nosema and Rice**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerRice | -0.0063  (0.0150) | -0.0042  (0.0150) | -0.0055  (0.0150) | -0.0036  (0.0151) | -0.0037  (0.0151) | -0.0062  (0.0151) |
| PerRice planting | 0.0047  (0.0339) | 0.0090  (0.0339) | 0.0058  (0.0339) | 0.0102  (0.0341) | 0.0126  (0.0341) | 0.0053  (0.0340) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1787 | 0.1851 | 0.1834 | 0.1928 | 0.1948 | 0.1791 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerRice | 0.0089  (0.0414) | 0.0187  (0.0416) | 0.0129  (0.0414) | 0.0202  (0.0416) | 0.0050  (0.0408) | 0.0121  (0.0415) |
| PerRice planting | -0.0101  (0.0503) | -0.0133  (0.0502) | -0.0121  (0.0503) | -0.0138  (0.0502) | 0.0080  (0.0498) | -0.0116  (0.0504) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2064 | 0.2121 | 0.2100 | 0.2152 | 0.2335 | 0.2081 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnRice | -0.0917\*  (0.0475) | -0.0806\*  (0.0489) | -0.0886\*  (0.0477) | -0.0772  (0.0479) | -0.1022\*\*  (0.0476) | -0.0896\*  (0.0481) |
| lnRice planting | 0.0643\*\*  (0.0270) | 0.0638\*\*  (0.0270) | 0.0659\*\*  (0.0270) | 0.0772\*\*\*  (0.0273) | 0.0848\*\*\*  (0.0277) | 0.0669\*\*  (0.0274) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1932 | 0.1949 | 0.1944 | 0.2118 | 0.2166 | 0.1982 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnRice | -0.0496  (0.0520) | -0.0379  (0.0535) | -0.0466  (0.0522) | -0.0274  (0.0520) | -0.0578  (0.0512) | -0.0478  (0.0522) |
| lnRice planting | 0.0173  (0.0295) | 0.0164  (0.0295) | 0.0184  (0.0296) | 0.0255  (0.0294) | 0.0401  (0.0296) | 0.0185  (0.0297) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2083 | 0.2099 | 0.2090 | 0.2263 | 0.2378 | 0.2094 |

**Varroa and Rice**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerRice | 0.0062  (0.0088) | 0.0073  (0.0088) | 0.0055  (0.0088) | 0.0066  (0.0089) | 0.0045  (0.0088) | 0.0057  (0.0087) |
| PerRice planting | 0.0058  (0.0216) | 0.0068  (0.0216) | 0.0056  (0.0216) | 0.0065  (0.0218) | 0.0026  (0.0217) | 0.0043  (0.0216) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1520 | 0.1539 | 0.1561 | 0.1526 | 0.1562 | 0.1597 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerRice | 0.0217  (0.0168) | 0.0247  (0.0170) | 0.0199  (0.0168) | 0.0243  (0.0170) | 0.0217  (0.0168) | 0.0184  (0.0168) |
| PerRice planting | -0.0072  (0.0258) | -0.0080  (0.0258) | -0.0062  (0.0257) | -0.0077  (0.0258) | -0.0096  (0.0259) | -0.0057  (0.0157) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1693 | 0.1711 | 0.1730 | 0.1718 | 0.1722 | 0.1760 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnRice | 0.0143  (0.0214) | 0.0141  (0.0216) | 0.0077  (0.0214) | 0.0090  (0.0218) | 0.0126  (0.0217) | 0.0071  (0.0217) |
| lnRice planting | 0.0145  (0.0134) | 0.0145  (0.0134) | 0.0136  (0.0133) | 0.0100  (0.0136) | 0.0064  (0.0138) | 0.0107  (0.0136) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1528 | 0.1528 | 0.1611 | 0.1533 | 0.1564 | 0.1575 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnRice | 0.0296  (0.0230) | 0.0295  (0.0233) | 0.0215  (0.0232) | 0.0271  (0.0233) | 0.0292  (0.0232) | 0.0223  (0.0233) |
| lnRice planting | -0.0068  (0.0149) | -0.0068  (0.0150) | -0.0062  (0.0149) | -0.0079  (0.0150) | -0.0098  (0.0151) | -0.0073  (0.0149) |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1689 | 0.1689 | 0.1755 | 0.1705 | 0.1720 | 0.1754 |

**Nosema and Barley**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerBarley | 0.0831  (0.0572) | 0.0968\*  (0.0574) | 0.0926  (0.0574) | 0.0966\*  (0.0577) | 0.0711  (0.0575) | 0.0822  (0.1831) |
| PerBarley planting | 2.5216  (4.3011) | 2.3353  (4.2865) | 2.2172  (4.2949) | 2.3636  (4.3123) | 2.8468  (4.314) | 2.4744  (4.3061) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1827 | 0.1904 | 0.1882 | 0.1982 | 0.1980 | 0.1831 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerBarley | 0.0777  (0.0564) | 0.0902  (0.0566) | 0.0864  (0.0566) | 0.0911  (0.0565) | 0.0565  (0.0559) | 0.0760  (0.0564) |
| PerBarley planting | 1.7969  (4.2468) | 1.6157  (4.2354) | 1.5928  (4.2424) | 1.5598  (4.2329) | 1.6164  (4.1896) | 1.7230  (4.2487) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2101 | 0.2166 | 0.2144 | 0.2197 | 0.2352 | 0.2116 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnBarley | 0.0182  (0.0411) | 0.0233  (0.0413) | 0.0164  (0.0412) | 0.0167  (0.0419) | 0.0077  (0.0419) | 0.0114  (0.0424) |
| lnBarley planting | 0.0474  (0.0304) | 0.0455  (0.0304) | 0.0479  (0.0304) | 0.0489  (0.0306) | 0.0536\*  (0.0307) | 0.0496  (0.0309) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1832 | 0.1864 | 0.1843 | 0.2003 | 0.2002 | 0.1879 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnBarley | 0.0212  (0.0417) | 0.0257  (0.0418) | 0.0197  (0.0418) | 0.0229  (0.0413) | 0.0067  (0.0412) | 0.0195  (0.0419) |
| lnBarley planting | 0.0164  (0.0319) | 0.0147  (0.0319) | 0.0171  (0.0320) | 0.0160  (0.0316) | 0.0239  (0.0315) | 0.0173  (0.0320) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2073 | 0.2098 | 0.2081 | 0.2257 | 0.2343 | 0.2084 |

**Varroa and Barley**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerBarley | -0.0928\*\*\*  (0.0346) | -0.0894\*\*\*  (0.0347) | -0.0987\*\*\*  (0.0346) | -0.0888\*\*  (0.0349) | -0.0870\*\*  (0.0348) | -0.0893\*\*\*  (0.0345) |
| PerBarley planting | -0.6198  (1.8546) | -0.6267  (1.8544) | -0.5632  (1.8502) | -0.5707  (1.8669) | -0.7994  (1.8651) | -0.6108  (1.8474) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1578 | 0.1588 | 0.1628 | 0.1579 | 0.1619 | 0.1651 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerBarley | -0.0910\*\*\*  (0.0346) | -0.0881\*\*  (0.0347) | -0.0969\*\*\*  (0.0346) | -0.0885\*\*  (0.0347) | -0.0877\*\*  (0.0347) | -0.0882\*\*  (0.0345) |
| PerBarley planting | -0.8303  (1.8554) | -0.8373  (1.8556) | -0.7948  (1.8511) | -0.8533  (1.8577) | -0.9447  (1.8579) | -0.8540  (1.8487) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1740 | 0.1748 | 0.1788 | 0.1756 | 0.1766 | 0.1809 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnBarley | -0.0417\*  (0.0214) | -0.0420\*  (0.0215) | -0.0384\*  (0.0214) | -0.0408\*  (0.0221) | -0.0382\*  (0.0221) | -0.0370\*  (0.0221) |
| lnBarley planting | -0.0023  (0.0142) | -0.0021  (0.0142) | -0.0026  (0.0141) | -0.0030  (0.0144) | -0.0052  (0.0144) | -0.0043  (0.0143) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1547 | 0.1548 | 0.1630 | 0.1559 | 0.1589 | 0.1596 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnBarley | -0.0343  (0.0220) | -0.0346  (0.0220) | -0.0309  (0.0219) | -0.0355  (0.0221) | -0.0336  (0.0221) | -0.0314  (0.0221) |
| lnBarley planting | -0.0172  (0.0152) | -0.0169  (0.0153) | -0.0172  (0.0152) | -0.0166  (0.0153) | -0.0179  (0.0153) | -0.0179  (0.0152) |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1710 | 0.1711 | 0.1779 | 0.1728 | 0.1740 | 0.1779 |

**Nosema and Spring Wheat**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerSpringwht | -0.0176  (0.0150) | -0.0126  (0.0153) | -0.0136  (0.0152) | -0.0116  (0.0153) | -0.0255\*  (0.0153) | -0.0178  (0.0150) |
| PerSpringwht planting | -3.5630  (4.3688) | -3.7083  (4.3600) | -3.6325  (4.3638) | -3.7792  (4.3852) | -3.1983  (4.3717) | -3.5221  (4.3732) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1818 | 0.1872 | 0.1856 | 0.1948 | 0.2003 | 0.1823 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerSpringwht | -0.0144  (0.0148) | -0.0097  (0.0151) | -0.0110  (0.0150) | -0.0092  (0.0150) | -0.0262\*  (0.0148) | -0.0150  (0.0148) |
| PerSpringwht planting | -3.6480  (4.3029) | -3.8457  (4.2973) | -3.6783  (4.3003) | -3.8959  (4.2950) | -3.3730  (4.2307) | -3.5139  (4.3058) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2092 | 0.2138 | 0.2120 | 0.2168 | 0.2396 | 0.2108 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnSpringwht | -0.0525  (0.0376) | -0.0442  (0.0387) | -0.0519  (0.0377) | -0.0494  (0.0377) | -0.0767\*\*  (0.0385) | -0.0524  (0.0380) |
| lnSpringwht planting | 0.0291  (0.0214) | 0.0271  (0.0215) | 0.0293  (0.0214) | 0.0262  (0.0215) | 0.0303  (0.0215) | 0.0296  (0.0217) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1854 | 0.1869 | 0.1864 | 0.2013 | 0.2055 | 0.1900 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnSpringwht | -0.0414  (0.0373) | -0.0333  (0.0385) | -0.0407  (0.0374) | -0.0358  (0.0370) | -0.0761\*\*  (0.0376) | -0.0420  (0.0374) |
| lnSpringwht planting | 0.0037  (0.0221) | 0.0019  (0.0222) | 0.0035  (0.0221) | 0.0005  (0.0220) | 0.0066  (0.0218) | 0.0038  (0.0222) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2086 | 0.2101 | 0.2094 | 0.2264 | 0.2407 | 0.2099 |

**Varroa and Spring Wheat**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerSpringwht | -0.0133  (0.0085) | -0.0119  (0.0086) | -0.0158\*  (0.0086) | -0.0135  (0.0087) | -0.0114  (0.0087) | -0.0123  (0.0085) |
| PerSpringwht planting | -0.0442  (0.0617) | -0.0456  (0.0617) | -0.0426  (0.0615) | -1.7722  (1.6420) | -1.8295  (1.6388) | -0.0596  (0.0616) |
| N | 963 | 963 | 963 | 908 | 908 | 963 |
| R-squared | 0.1541 | 0.1552 | 0.1592 | 0.1549 | 0.1585 | 0.1620 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerSpringwht | -0.0113  (0.0086) | -0.0100  (0.0087) | -0.0137  (0.0086) | -0.0101  (0.0087) | -0.0095  (0.0087) | -0.0100  (0.0086) |
| PerSpringwht planting | -1.9169  (1.6315) | -1.9256  (1.6316) | -1.9417  (1.7279) | -1.9379  (1.6335) | -1.9524  (1.6326) | -2.0055  (1.6258) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1700 | 0.1709 | 0.1747 | 0.1717 | 0.1726 | 0.1771 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnSpringwht | -0.0527\*\*  (0.0208) | -0.0544\*\*\*  (0.0211) | -0.0535\*\*\*  (0.0207) | -0.0558\*\*\*  (0.0210) | -0.0481\*\*  (0.0213) | -0.0538\*\*  (0.0210) |
| lnSpringwht planting | -0.0142  (0.0112) | -0.0138  (0.0113) | -0.0132  (0.0112) | -0.0123  (0.0114) | -0.0134  (0.0114) | -0.0126  (0.0114) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1584 | 0.1586 | 0.1671 | 0.1602 | 0.1618 | 0.1640 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnSpringwht | -0.0459\*\*  (0.0210) | -0.0476\*\*  (0.0213) | -0.0464\*\*  (0.0209) | -0.0466\*\*  (0.0210) | -0.0418\*\*  (0.0213) | -0.0444\*\*  (0.0210) |
| lnSpringwht planting | -0.0225\*  (0.0119) | -0.0221\*  (0.0119) | -0.0204\*  (0.0119) | -0.0219\*  (0.0119) | -0.0225\*  (0.0119) | -0.0212\*  (0.0119) |
| N | 885 | 885 | 875 | 875 | 875 | 875 |
| R-squared | 0.1752 | 0.1754 | 0.1820 | 0.1769 | 0.1773 | 0.1816 |

**Nosema and Winter Wheat**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerWinterwht | 0.0128  (0.0224) | 0.0210  (0.0228) | 0.0155  (0.0225) | 0.0211  (0.0233) | 0.0140  (0.0229) | 0.0120  (0.0225) |
| PerWinterwht planting | -0.0461  (0.0379) | -0.0432  (0.0379) | -0.0439  (0.0379) | -0.0419  (0.0385) | -0.0277  (0.0392) | -0.0458  (0.0380) |
| N | 465 | 465 | 465 | 449 | 449 | 465 |
| R-squared | 0.1811 | 0.1875 | 0.1855 | 0.1950 | 0.1956 | 0.1815 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerWinterwht | 0.0069  (0.0225) | 0.0133  (0.0229) | 0.0096  (0.0226) | 0.0141  (0.0228) | 0.0074  (0.0223) | 0.0054  (0.0226) |
| PerWinterwht planting | -0.0646\*  (0.0381) | -0.0620  (0.0381) | -0.0626  (0.0381) | -0.0609  (0.0381) | -0.0426  (0.0381) | -0.0640\*  (0.0381) |
| N | 437 | 437 | 437 | 434 | 434 | 437 |
| R-squared | 0.2127 | 0.2168 | 0.2155 | 0.2196 | 0.2356 | 0.2144 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnWinterwht | -0.0344  (0.0233) | -0.0276  (0.0241) | -0.0373  (0.0235) | -0.0255  (0.0243) | -0.0359  (0.0238) | -0.0401\*  (0.0243) |
| lnWinterwht planting | 0.0215  (0.0157) | 0.0220  (0.0157) | 0.0232  (0.0158) | 0.0301\*  (0.0166) | 0.0362\*\*  (0.0170) | 0.0215  (0.0164) |
| N | 465 | 465 | 465 | 449 | 449 | 449 |
| R-squared | 0.1843 | 0.1866 | 0.1863 | 0.2023 | 0.2048 | 0.1895 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(nosema) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnWinterwht | -0.0367  (0.0239) | -0.0325  (0.0246) | -0.0376  (0.0239) | -0.0263  (0.0241) | -0.0385  (0.0236) | -0.0383  (0.0241) |
| lnWinterwht planting | -0.0016  (0.0177) | -0.0009  (0.0178) | -0.0007  (0.0178) | 0.0087  (0.0180) | 0.0169  (0.0181) | -0.0007  (0.0178) |
| N | 437 | 437 | 437 | 434 | 434 | 434 |
| R-squared | 0.2111 | 0.2122 | 0.2121 | 0.2270 | 0.2386 | 0.2126 |

**Varroa and Winter Wheat**

With percentage treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| PerWinterwht | -0.0038  (0.0111) | -0.0014  (0.0112) | -0.0051  (0.0111) | -0.0003  (0.0114) | -0.0038  (0.0113) | -0.0012  (0.0111) |
| PerWinterwht planting | 0.0022  (0.0163) | 0.0029  (0.0163) | 0.0015  (0.0163) | 0.0174  (0.0186) | 0.0094  (0.0187) | 0.0018  (0.0163) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1514 | 0.1529 | 0.1588 | 0.1529 | 0.1561 | 0.1591 |

With percentage treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| PerWinterwht | -0.0027  (0.0113) | -0.0006  (0.0114) | -0.0043  (0.0113) | -0.0011  (0.0114) | -0.0035  (0.0113) | -0.0002  (0.0112) |
| PeWinterwht planting | 0.0066  (0.0186) | 0.0079  (0.0187) | 0.0058  (0.0186) | 0.0087  (0.0187) | 0.0037  (0.0188) | 0.0082  (0.0186) |
| N | 885 | 885 | 885 | 875 | 875 | 885 |
| R-squared | 0.1674 | 0.1687 | 0.1714 | 0.1694 | 0.1703 | 0.1748 |

With natural log treated crop area and forage controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (1) | (2) | (3) | (4) | (5) | (6) |
| lnWinterwht | -0.0153  (0.0106) | -0.0156  (0.0108) | -0.0106  (0.0106) | -0.0171  (0.0112) | -0.0164  (0.0110) | -0.0107  (0.0111) |
| lnWinterwht planting | 0.0220\*\*\*  (0.0068) | 0.0219\*\*\*  (0.0069) | 0.0211\*\*\*  (0.0068) | 0.0223\*\*\*  (0.0074) | 0.0202\*\*\*  (0.0076) | 0.0230\*\*\*  (0.0072) |
| N | 963 | 963 | 963 | 908 | 908 | 908 |
| R-squared | 0.1607 | 0.1607 | 0.1684 | 0.1618 | 0.1632 | 0.1664 |

With natural log treated crop area, forage and weather controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Ln(mites+1) | (7) | (8) | (9) | (10) | (11) | (12) |
| lnWinterwht | -0.0113  (0.0111) | -0.0117  (0.0113) | -0.0083  (0.0112) | -0.0141  (0.0114) | -0.0135  (0.0112) | -0.0088  (0.0113) |
| lnWinterwht planting | 0.0158\*\*  (0.0080) | 0.0157\*\*  (0.0080) | 0.0157\*\*  (0.0079) | 0.0152\*  (0.0081) | 0.0142\*  (0.0082) | 0.0165\*\*  (0.0080) |
| N | 885 | 885 | 885 | 875 | 875 | 875 |
| R-squared | 0.1712 | 0.1713 | 0.1784 | 0.1729 | 0.1737 | 0.1785 |

**Simple Crop Models - Nosema**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Corn |  | Cotton |  | Sorghum |  |
|  | Percentage | Log | Percentage | Log | Percentage | Log |
| All | 0.0067  (0.0074) | -0.0430\*  (0.0249) | 0.0778  (0.0828) | -0.0496  (0.0329) | 0.0250  (0.0716) | -0.0554  (0.0414) |
| During planting | -0.0137  (0.0153) | 0.0130  (0.0180) | -1.3556  (2.8173) | 0.0713\*\*  (0.0279) | 0.1508\*  (0.0906) | 0.0517\*\*  (0.0253) |
| During blooming | -0.0099  (0.0091) | 0.0060  (0.0125) | -0.0977  (0.0860) | 0.0231  (0.0221) | -0.1382  (0.0925) | 0.0129  (0.0201) |
|  |  |  |  |  |  |  |
|  | Soy |  | Canola |  |  |  |
| All | -0.0130  (0.0146) | -0.0256  (0.0194) | -0.0121  (0.0486) | 0.0678  (0.0491) |  |  |
| During planting | -0.0016  (0.0158) | 0.0028  (0.0178) | 1.0588  (1.1909) | 0.0440  (0.0302) |  |  |
| During blooming | 0.0047  (0.0148) | 0.0081  (0.0127) | 0.0773  (0.1180) | -0.0463\*\*  (0.0193) |  |  |
|  |  |  |  |  |  |  |

**Simple Crop Models - Varroa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Corn |  | Cotton |  | Sorghum |  |
|  | Percentage | Log | Percentage | Log | Percentage | Log |
| All | -0.0064\*  (0.0033) | -0.0410\*\*\*  (0.0105) | -0.0028  (0.0144) | -0.0464\*\*\*  (0.0128) | -0.0313  (0.0373) | -0.0250  (0.0183) |
| During planting | 0.0089  (0.0072) | -0.0022  (0.0083) | 0.0029  (0.0417) | 0.0004  (0.0124) | 0.0303  (0.0379) | -0.0037  (0.0124) |
| During blooming | -0.0018  (0.0042) | -0.0012  (0.0053) | -0.0158  (0.0158) | 0.0040  (0.0085) | -0.0003  (0.0449) | 0.0007  (0.0083) |
|  |  |  |  |  |  |  |
|  | Soy |  | Canola |  |  |  |
| All | 0.0116\*  (0.0069) | -0.0222\*\*  (0.0088) | -0.0832\*\*\*  (0.0311) | -0.0129  (0.0273) |  |  |
| During planting | -0.0078  (0.0072) | -0.0066  (0.0082) | 0.2343  (0.3571) | 0.0175  (0.0142) |  |  |
| During blooming | -0.0123\*  (0.0070) | -0.0003  (0.0055) | 0.0260  (0.0766) | -0.0345\*\*\*  (0.0086) |  |  |
|  |  |  |  |  |  |  |

\*Wheat, barley and rice don’t have blooming time information

**Threshold Models**

Nosema OLS Full Crop Models with Percentage and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| nosemathresh | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | -0.0006  (0.0014) | -0.0002  (0.0014) | -0.0007  (0.0014) | 0.0003  (0.0015) | 0.0000  (0.0014) | -0.0005  (0.0014) |
| Soy | 0.0004  (0.0015) | 0.0007  (0.0015) | 0.0003  (0.0015) | 0.0005  (0.0015) | 0.0002  (0.0015) | 0.0004  (0.0015) |
| Cotton | -0.0008  (0.0026) | -0.0005  (0.0026) | -0.0008  (0.0026) | -0.0003  (0.0028) | -0.0005  (0.0027) | -0.0007  (0.0026) |
| Canola | 0.0083  (0.0150) | 0.0086  (0.0150) | 0.0083  (0.0150) | 0.0078  (0.0151) | 0.0075  (0.0151) | 0.0086  (0.0150) |
| Sorghum | 0.0099\*\*  (0.0050) | 0.0103\*\*  (0.0050) | 0.0098\*  (0.0050) | 0.0105\*\*  (0.0051) | 0.0094\*  (0.0051) | 0.0100\*\*  (0.0050) |
| Rice | 0.0013  (0.0026) | 0.0015  (0.0027) | 0.0012  (0.0026) | 0.0027  (0.0027) | 0.0028  (0.0027) | 0.0013  (0.0026) |
| Barley | 0.0388\*\*  (0.0155) | 0.0398\*\*\*  (0.0155) | 0.0382\*\*  (0.0155) | 0.0332\*\*  (0.0160) | 0.0318\*\*  (0.0160) | 0.0387\*\*  (0.0155) |
| Spring wheat | -0.0059  (0.0045) | -0.0054  (0.0045) | -0.0062  (0.0045) | -0.0031  (0.0046) | -0.0054  (0.0046) | -0.0058  (0.0045) |
| Winter wheat | -0.0066\*  (0.0035) | -0.0057  (0.0036) | -0.0068\*  (0.0036) | -0.0064  (0.0040) | -0.0060  (0.0039) | -0.0063\*  (0.0036) |
| Natural |  | 0.0006  (0.0005) |  |  |  |  |
| Natural during bloom |  |  | -0.0004  (0.0004) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000  (0.0000) |  |  |
| ndvi |  |  |  |  | 0.0019\*  (0.0007) |  |
| NDVI in bloom |  |  |  |  |  | -0.0001  (0.0001) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 1038 | 1038 | 1038 | 971 | 971 | 1038 |
| R-squared | 0.1690 | 0.1699 | 0.1697 | 0.1532 | 0.1569 | 0.1695 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| nosemathresh | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | 0.0013  (0.0014) | 0.0016  (0.0014) | 0.0013  (0.0014) | 0.0019  (0.0014) | 0.0016  (0.0014) | 0.0011  (0.0014) |
| Soy | -0.0016  (0.0015) | -0.0014  (0.0015) | -0.0015  (0.0015) | -0.0015  (0.0015) | -0.0017  (0.0015) | -0.0015  (0.0015) |
| Cotton | -0.0000  (0.0025) | 0.0002  (0.0025) | -0.0000  (0.0025) | 0.0004  (0.0026) | 0.0003  (0.0026) | -0.0001  (0.0025) |
| Canola | 0.0070  (0.0144) | 0.0072  (0.0144) | 0.0070  (0.0144) | 0.0069  (0.0144) | 0.0065  (0.0144) | 0.0070  (0.0144) |
| Sorghum | 0.0127\*\*\*  (0.0048) | 0.0130\*\*\*  (0.0048) | 0.0127\*\*\*  (0.0048) | 0.0129\*\*\*  (0.0048) | 0.0123\*\*  (0.0048) | 0.0127\*\*\*  (0.0048) |
| Rice | 0.0050  (0.0032) | 0.0053  (0.0032) | 0.0050  (0.0032) | 0.0070\*\*  (0.0033) | 0.0069\*\*  (0.0033) | 0.0050  (0.0032) |
| Barley | 0.0303\*\*  (0.0153) | 0.0311\*\*  (0.0153) | 0.0305\*\*  (0.0153) | 0.0315\*\*  (0.0153) | 0.0302\*\*  (0.0153) | 0.0302\*\*  (0.0153) |
| Spring wheat | -0.0036  (0.0043) | -0.0032  (0.0044) | -0.0035  (0.0044) | -0.0029  (0.0044) | -0.0042  (0.0044) | -0.0038  (0.0044) |
| Winter wheat | -0.0062\*  (0.0037) | -0.0055  (0.0038) | -0.0061  (0.0037) | -0.0054  (0.0038) | -0.0058  (0.0038) | -0.0065\*  (0.0037) |
| Average temperature | -0.0007  (0.0022) | -0.0007  (0.0022) | -0.0007  (0.0022) | -0.0006  (0.0022) | -0.0018  (0.0024) | -0.0008  (0.0022) |
| Average precipitation | 0.0001  (0.0002) | 0.0001  (0.0002) | 0.0001  (0.0002) | 0.0001  (0.0002) | 0.0000  (0.0002) | 0.0001  (0.0002) |
| Natural |  | 0.0005  (0.0005) |  |  |  |  |
| Natural in bloom |  |  | 0.0001  (0.0005) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000  (0.0000) |  |  |
| NDVI |  |  |  |  | 0.0011  (0.0008) |  |
| NDVI in bloom |  |  |  |  |  | 0.0001  (0.0001) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 925 | 925 | 925 | 912 | 912 | 925 |
| R-squared | 0.1253 | 0.1259 | 0.1254 | 0.1182 | 0.1185 | 0.1258 |

Nosema OLS Full Crop Models with Percentage, Forage and Weather Controls

Varroa OLS Full Crop Models with Percentage and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| mitesthresh | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | -0.0060\*\*\*  (0.0020) | -0.0062\*\*\*  (0.0020) | -0.0062\*\*\*  (0.0020) | -0.0067\*\*\*  (0.0021) | -0.0067\*\*\*  (0.0020) | -0.0057\*\*\*  (0.0020) |
| Soy | 0.0047\*\*  (0.0021) | 0.0045\*\*  (0.0021) | 0.0043\*\*  (0.0021) | 0.0047\*\*  (0.0022) | 0.0047\*\*  (0.0021) | 0.0047\*\*  (0.0021) |
| Cotton | -0.0084\*\*  (0.0037) | -0.0086\*\*  (0.0037) | -0.0084\*\*  (0.0037) | -0.0102\*\*\*  (0.0039) | -0.0102\*\*\*  (0.0039) | -0.0081\*\*  (0.0037) |
| Canola | -0.0315  (0.0214) | -0.0316  (0.0214) | -0.0317  (0.0214) | -0.0315  (0.0215) | -0.0314  (0.0215) | -0.0310  (0.0214) |
| Sorghum | 0.0015  (0.0072) | 0.0012  (0.0072) | 0.0013  (0.0072) | 0.0008  (0.0072) | 0.0013  (0.0072) | 0.0018  (0.0072) |
| Rice | 0.0039  (0.0038) | 0.0037  (0.0038) | 0.0038  (0.0038) | 0.0046  (0.0038) | 0.0044  (0.0038) | 0.0040  (0.0038) |
| Barley | -0.0230  (0.0221) | -0.0237  (0.0221) | -0.0245  (0.0221) | -0.0326  (0.0228) | -0.0322  (0.0227) | -0.0231  (0.0221) |
| Spring wheat | -0.0023  (0.0064) | -0.0026  (0.0064) | -0.0030  (0.0064) | -0.0006  (0.0065) | 0.0006  (0.0065) | -0.0020  (0.0064) |
| Winter wheat | -0.0062  (0.0051) | -0.0068  (0.0052) | -0.0067  (0.0051) | -0.0038  (0.0056) | -0.0045  (0.0056) | -0.0056  (0.0051) |
| Natural |  | -0.0004  (0.0008) |  |  |  |  |
| Natural during bloom |  |  | -0.0010  (0.0006) |  |  |  |
| Natural\*ndvi |  |  |  | -0.0000  (0.0000) |  |  |
| ndvi |  |  |  |  | -0.0012  (0.0010) |  |
| NDVI in bloom |  |  |  |  |  | -0.0002  (0.0002) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 1038 | 1038 | 1038 | 971 | 971 | 1038 |
| R-squared | 0.0770 | 0.0773 | 0.0793 | 0.0874 | 0.0887 | 0.0787 |

Varroa OLS Full Crop Models with Percentage, Forage and Weather Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| mitesthresh | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | -0.0057\*\*\*  (0.0021) | -0.0059\*\*\*  (0.0021) | -0.0060\*\*\*  (0.0021) | -0.0058\*\*\*  (0.0022) | -0.0059\*\*\*  (0.0021) | -0.0057\*\*\*  (0.0021) |
| Soy | 0.0040\*  (0.0022) | 0.0038\*  (0.0022) | 0.0035  (0.0022) | 0.0036  (0.0023) | 0.0033  (0.0022) | 0.0040\*  (0.0022) |
| Cotton | -0.0081\*\*  (0.0037) | -0.0082\*\*  (0.0037) | -0.0081\*\*  (0.0037) | -0.0096\*\*  (0.0039) | -0.0098\*\*  (0.0039) | -0.0080\*\*  (0.0037) |
| Canola | -0.0326  (0.0214) | -0.0327  (0.0214) | -0.0327  (0.0214) | -0.0330  (0.0214) | -0.0326  (0.0214) | -0.0326  (0.0214) |
| Sorghum | 0.0028  (0.0072) | 0.0026  (0.0072) | 0.0025  (0.0072) | 0.0025  (0.0072) | 0.0030  (0.0072) | 0.0028  (0.0072) |
| Rice | 0.0081\*  (0.0048) | 0.0079  (0.0048) | 0.0081\*  (0.0048) | 0.0090\*  (0.0049) | 0.0088\*  (0.0049) | 0.0081\*  (0.0048) |
| Barley | -0.0348  (0.0227) | -0.0354  (0.0227) | -0.0365  (0.0227) | -0.0353  (0.0227) | -0.0346  (0.0226) | -0.0348  (0.0227) |
| Spring wheat | 0.0009  (0.0065) | 0.0006  (0.0065) | 0.0001  (0.0065) | 0.0009  (0.0065) | 0.0025  (0.0065) | 0.0009  (0.0065) |
| Winter wheat | -0.0034  (0.0055) | -0.0039  (0.0057) | -0.0042  (0.0056) | -0.0039  (0.0057) | -0.0046  (0.0056) | -0.0034  (0.0056) |
| Average temperature | -0.0016  (0.0033) | -0.0016  (0.0033) | -0.0014  (0.0033) | -0.0011  (0.0033) | 0.0012  (0.0036) | -0.0016  (0.0033) |
| Average precipitation | -0.0003  (0.0003) | -0.0003  (0.0003) | -0.0004  (0.0003) | -0.0003  (0.0003) | -0.0003  (0.0003) | -0.0003  (0.0003) |
| Natural |  | -0.0004  (0.0008) |  |  |  |  |
| Natural in bloom |  |  | -0.0011\*  (0.0007) |  |  |  |
| Natural\*ndvi |  |  |  | -0.0000  (0.0000) |  |  |
| NDVI |  |  |  |  | -0.0021\*  (0.0012) |  |
| NDVI in bloom |  |  |  |  |  | -0.0000  (0.0002) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 925 | 925 | 925 | 912 | 912 | 925 |
| R-squared | 0.1037 | 0.1039 | 0.1065 | 0.1063 | 0.1093 | 0.1037 |

Nosema OLS Full Crop Models with Natural Log and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| nosemathresh | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | -0.0161\*\*  (0.0067) | -0.0161\*\*  (0.0067) | -0.0160\*\*  (0.0067) | -0.0170\*\*  (0.0069) | -0.0181\*\*\*  (0.0069) | -0.0166\*\*  (0.0069) |
| Soy | -0.0004  (0.0052) | -0.0004  (0.0052) | -0.0003  (0.0052) | 0.0009  (0.0054) | 0.0006  (0.0053) | 0.0003  (0.0054) |
| Cotton | -0.0025  (0.0058) | -0.0025  (0.0058) | -0.0021  (0.0058) | -0.0024  (0.0060) | -0.0016  (0.0060) | -0.0021  (0.0061) |
| Canola | 0.0089  (0.0134) | 0.0089  (0.0134) | 0.0088  (0.0134) | 0.0119  (0.0136) | 0.0080  (0.0137) | 0.0119  (0.0137) |
| Sorghum | 0.0086  (0.0075) | 0.0086  (0.0075) | 0.0086  (0.0075) | 0.0067  (0.0077) | 0.0062  (0.0077) | 0.0064  (0.0077) |
| Rice | 0.0014  (0.0090) | 0.0015  (0.0091) | 0.0006  (0.0091) | 0.0039  (0.0092) | 0.0021  (0.0092) | 0.0021  (0.0093) |
| Barley | -0.0045  (0.0100) | -0.0045  (0.0100) | -0.0044  (0.0100) | -0.0103  (0.0106) | -0.0096  (0.0106) | -0.0093  (0.0106) |
| Spring wheat | 0.0005  (0.0103) | 0.0005  (0.0103) | 0.0003  (0.0103) | 0.0063  (0.0105) | 0.0034  (0.0106) | 0.0063  (0.0106) |
| Winter wheat | 0.0057  (0.0050) | 0.0057  (0.0051) | 0.0060  (0.0051) | 0.0082  (0.0053) | 0.0092\*  (0.0053) | 0.0068  (0.0053) |
| Natural |  | 0.0001  (0.0087) |  |  |  |  |
| Natural during bloom |  |  | -0.0011  (0.0017) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0001\*  (0.0000) |  |  |
| ndvi |  |  |  |  | 0.0020\*\*\*  (0.0007) |  |
| NDVI in bloom |  |  |  |  |  | -0.0033  (0.0053) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 1038 | 1038 | 1038 | 971 | 971 | 971 |
| R-squared | 0.1689 | 0.1689 | 0.1692 | 0.1565 | 0.1604 | 0.1537 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| nosemathresh | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | -0.0096  (0.0069) | -0.0095  (0.0069) | -0.0097  (0.0069) | -0.0093  (0.0069) | -0.0102  (0.0070) | -0.0094  (0.0069) |
| Soy | -0.0002  (0.0053) | -0.0001  (0.0054) | -0.0004  (0.0053) | 0.0003  (0.0054) | 0.0004  (0.0054) | -0.0006  (0.0054) |
| Cotton | -0.0049  (0.0059) | -0.0050  (0.0059) | -0.0058  (0.0059) | -0.0045  (0.0060) | -0.0038  (0.0060) | -0.0055  (0.0060) |
| Canola | 0.0132  (0.0131) | 0.0135  (0.0132) | 0.0133  (0.0131) | 0.0125  (0.0131) | 0.0102  (0.0132) | 0.0120  (0.0131) |
| Sorghum | 0.0136\*  (0.0075) | 0.0137\*  (0.0075) | 0.0139\*  (0.0075) | 0.0130\*  (0.0076) | 0.0130\*  (0.0076) | 0.0130\*  (0.0076) |
| Rice | -0.0006  (0.0093) | -0.0003  (0.0094) | 0.0008  (0.0094) | 0.0020  (0.0095) | 0.0010  (0.0094) | 0.0027  (0.0095) |
| Barley | -0.0079  (0.0101) | -0.0081  (0.0102) | -0.0082  (0.0101) | -0.0058  (0.0103) | -0.0054  (0.0102) | -0.0054  (0.0103) |
| Spring wheat | 0.0008  (0.0101) | 0.0010  (0.0102) | 0.0011  (0.0101) | 0.0010  (0.0102) | -0.0004  (0.0102) | 0.0010  (0.0102) |
| Winter wheat | 0.0045  (0.0051) | 0.0046  (0.0051) | 0.0041  (0.0051) | 0.0043  (0.0052) | 0.0047  (0.0052) | 0.0031  (0.0053) |
| Average temperature | -0.0003  (0.0022) | -0.0003  (0.0022) | -0.0005  (0.0022) | -0.0007  (0.0023) | -0.0016  (0.0024) | -0.0003  (0.0023) |
| Average precipitation | 0.0001  (0.0002) | 0.0001  (0.0002) | 0.0001  (0.0002) | 0.0001  (0.0002) | 0.0000  (0.0002) | 0.0001  (0.0002) |
| Natural |  | 0.0020  (0.0088) |  |  |  |  |
| Natural in bloom |  |  | 0.0019  (0.0018) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000  (0.0002) |  |  |
| NDVI |  |  |  |  | 0.0012  (0.0008) |  |
| NDVI in bloom |  |  |  |  |  | 0.0055  (0.0055) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 925 | 925 | 925 | 912 | 912 | 912 |
| R-squared | 0.1189 | 0.1189 | 0.1199 | 0.1082 | 0.1095 | 0.1081 |

Nosema OLS Full Crop Models with Natural Log, Forage and Weather Controls

Varroa OLS Full Crop Models with Natural Log and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| mitesthresh | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | -0.0289\*\*\*  (0.0095) | -0.0296\*\*\*  (0.0095) | -0.0289\*\*\*  (0.0095) | -0.0312\*\*\*  (0.0098) | -0.0309\*\*\*  (0.0098) | -0.0315\*\*\*  (0.0098) |
| Soy | -0.0008  (0.0073) | -0.0013  (0.0073) | -0.0008  (0.0073) | -0.0008  (0.0076) | -0.0003  (0.0076) | -0.0003  (0.0076) |
| Cotton | -0.0139\*  (0.0082) | -0.0138\*  (0.0082) | -0.0139\*  (0.0082) | -0.0151\*  (0.0085) | -0.0152\*  (0.0085) | -0.0153\*  (0.0086) |
| Canola | -0.0354\*  (0.0189) | -0.0376\*  (0.0190) | -0.0354\*  (0.0189) | -0.0301  (0.0193) | -0.0289  (0.0194) | -0.0301  (0.0193) |
| Sorghum | -0.0009  (0.0106) | -0.0014  (0.0106) | -0.0009  (0.0106) | -0.0027  (0.0109) | -0.0025  (0.0109) | -0.0025  (0.0109) |
| Rice | 0.0285\*\*  (0.0128) | 0.0262\*\*  (0.0129) | 0.0284\*\*  (0.0129) | 0.0271\*\*  (0.0130) | 0.0282\*\*  (0.0130) | 0.0286\*\*  (0.0131) |
| Barley | -0.0184  (0.0141) | -0.0171  (0.0141) | -0.0184  (0.0141) | -0.0226  (0.0150) | -0.0233  (0.0150) | -0.0234  (0.0150) |
| Spring wheat | 0.0030  (0.0145) | 0.0016  (0.0146) | 0.0029  (0.0145) | 0.0054  (0.0149) | 0.0062  (0.0150) | 0.0054  (0.0149) |
| Winter wheat | 0.0130\*  (0.0071) | 0.0119  (0.0072) | 0.0130\*  (0.0072) | 0.0129\*  (0.0075) | 0.0136\*  (0.0075) | 0.0140\*  (0.0074) |
| Natural |  | -0.0154  (0.0124) |  |  |  |  |
| Natural during bloom |  |  | -0.0001  (0.0024) |  |  |  |
| Natural\*ndvi |  |  |  | -0.0000  (0.0000) |  |  |
| ndvi |  |  |  |  | -0.0006  (0.0010) |  |
| NDVI in bloom |  |  |  |  |  | 0.0029  (0.0075) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 1038 | 1038 | 1038 | 971 | 971 | 971 |
| R-squared | 0.0898 | 0.0912 | 0.0899 | 0.1001 | 0.0993 | 0.0991 |

Varroa OLS Full Crop Models with Natural Log, Forage and Weather Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| mitesthresh | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | -0.0299\*\*\*  (0.0102) | -0.0303\*\*\*  (0.0102) | -0.0299\*\*\*  (0.0102) | -0.0305\*\*\*  (0.0102) | -0.0296\*\*\*  (0.0103) | -0.0312\*\*\*  (0.0102) |
| Soy | 0.0013  (0.0079) | 0.0006  (0.0079) | 0.0012  (0.0079) | 0.0007  (0.0080) | 0.0011  (0.0080) | 0.0019  (0.0079) |
| Cotton | -0.0135  (0.0086) | -0.0133  (0.0086) | -0.0137  (0.0087) | -0.0143  (0.0088) | -0.0149\*  (0.0088) | -0.0146\*  (0.0089) |
| Canola | -0.0302  (0.0193) | -0.0323\*  (0.0194) | -0.0302  (0.0193) | -0.0315  (0.0193) | -0.0286  (0.0194) | -0.0314  (0.0193) |
| Sorghum | 0.0003  (0.0111) | -0.0001  (0.0111) | 0.0004  (0.0111) | -0.0005  (0.0112) | -0.0003  (0.0194) | 0.0005  (0.0112) |
| Rice | 0.0330\*\*  (0.0138) | 0.0312\*\*  (0.0139) | 0.0334\*\*  (0.0139) | 0.0314\*\*  (0.0139) | 0.0331\*\*  (0.0139) | 0.0336\*\*  (0.0140) |
| Barley | -0.0193  (0.0150) | -0.0181  (0.0150) | -0.0194  (0.0150) | -0.0161  (0.0151) | -0.0171  (0.0151) | -0.0173  (0.0151) |
| Spring wheat | 0.0039  (0.0149) | 0.0028  (0.0150) | 0.0040  (0.0150) | 0.0040  (0.0149) | 0.0059  (0.0150) | 0.0042  (0.0150) |
| Winter wheat | 0.0135\*  (0.0076) | 0.0129\*  (0.0076) | 0.0135\*  (0.0076) | 0.0112  (0.0077) | 0.0112  (0.0077) | 0.0122  (0.0077) |
| Average temperature | -0.0008  (0.0033) | -0.0008  (0.0033) | -0.0009  (0.0033) | 0.0006  (0.0034) | 0.0013  (0.0037) | -0.0006  (0.0033) |
| Average precipitation | -0.0002  (0.0003) | -0.0002  (0.0003) | -0.0002  (0.0003) | -0.0002  (0.0003) | -0.0002  (0.0003) | -0.0002  (0.0003) |
| Natural |  | -0.0131  (0.0130) |  |  |  |  |
| Natural in bloom |  |  | 0.0005  (0.0027) |  |  |  |
| Natural\*ndvi |  |  |  | -0.0001  (0.0000) |  |  |
| NDVI |  |  |  |  | -0.0015  (0.0012) |  |
| NDVI in bloom |  |  |  |  |  | 0.0051  (0.0081) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 925 | 925 | 925 | 912 | 912 | 912 |
| R-squared | 0.1118 | 0.1128 | 0.1118 | 0.1144 | 0.1142 | 0.1129 |

















|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Varroa Mites | | | Nosema | | |
|  | All | During Planting | During Bloom | All | During Planting | During Bloom |
| Corn | Uncorrelated | Positive | Positive | Uncorrelated | Negative | Negative |
| Soy | Uncorrelated | Nonlinear positive | Positive | Uncorrelated | Uncorrelated | Negative |
| Cotton | Nonlinear positive | Unclear | Uncorrelated | Nonlinear positive | Negative | Unclear |
| Canola | Negative | Unclear | Negative | Positive | Unclear | Positive |
| Sorghum | Slight positive | Unclear | Slight positive | Nonlinear positive | Unclear | Nonlinear positive |
| Rice | Positive | Unclear | - | Slight positive | Unclear | - |
| Barley | Negative | Negative | - | Nonlinear negative | Slight negative | - |
| Spring wheat | Negative | Unclear | - | Positive | Nonlinear positive | - |
| Winter wheat | Unclear | Negative | - | Nonlinear negative | Negative | - |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Nosema\_d | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | 0.0029  (0.0019) | 0.0036\*  (0.0020) | 0.0030  (0.0019) | 0.0037\*  (0.0021) | 0.0034\*  (0.0020) | 0.0028  (0.0020) |
| Soy | -0.0016  (0.0021) | -0.0011  (0.0021) | -0.0015  (0.0021) | -0.0010  (0.0021) | -0.0014  (0.0021) | -0.0026  (0.0021) |
| Cotton | -0.0049  (0.0036) | -0.0044  (0.0037) | -0.0049  (0.0036) | -0.0043  (0.0039) | -0.0047  (0.0038) | -0.0050  (0.0037) |
| Canola | 0.0247  (0.0211) | 0.0251  (0.0211) | 0.0247  (0.0211) | 0.0207  (0.0212) | 0.0202  (0.0211) | 0.0245  (0.0211) |
| Sorghum | 0.0029  (0.0071) | 0.0036  (0.0071) | 0.0030  (0.0071) | 0.0035  (0.0071) | 0.0018  (0.0071) | 0.0028  (0.0071) |
| Rice | 0.0030  (0.0037) | 0.0035  (0.0037) | 0.0030  (0.0037) | 0.0038  (0.0038) | 0.0041  (0.0037) | 0.0030  (0.0037) |
| Barley | -0.0029  (0.0217) | -0.0010  (0.0218) | -0.0023  (0.0218) | -0.0088  (0.0225) | -0.0107  (0.0223) | -0.0028  (0.0218) |
| Spring wheat | 0.0019  (0.0063) | 0.0028  (0.0063) | 0.0022  (0.0063) | 0.0056  (0.0064) | 0.0021  (0.0064) | 0.0018  (0.0063) |
| Winter wheat | -0.0026  (0.0050) | -0.0010  (0.0051) | -0.0024  (0.0050) | -0.0002  (0.0055) | 0.0006  (0.0055) | -0.0028  (0.0050) |
| Natural |  | 0.0010  (0.0007) |  |  |  |  |
| Natural during bloom |  |  | 0.0004  (0.0006) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000  (0.0000) |  |  |
| ndvi |  |  |  |  | 0.0030\*\*  (0.0010) |  |
| NDVI in bloom |  |  |  |  |  | 0.0001  (0.0002) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 1038 | 1038 | 1038 | 971 | 971 | 1038 |
| R-squared | 0.1228 | 0.1244 | 0.1231 | 0.1227 | 0.1284 | 0.1229 |

**Robustness Check**

Nosema Detection OLS Full Crop Models with Percentage and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Nosema\_d | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | 0.0039\*  (0.0020) | 0.0050\*\*  (0.0021) | 0.0043\*\*  (0.0020) | 0.0050\*\*  (0.0021) | 0.0042\*\*  (0.0021) | 0.0028\*  (0.0021) |
| Soy | -0.0028  (0.0022) | -0.0020  (0.0022) | -0.0023  (0.0022) | -0.0021  (0.0022) | -0.0026  (0.0022) | -0.0028  (0.0022) |
| Cotton | -0.0052  (0.0037) | -0.0044  (0.0037) | -0.0051  (0.0037) | -0.0042  (0.0039) | -0.0046  (0.0038) | -0.0052  (0.0037) |
| Canola | 0.0218  (0.0211) | 0.0224  (0.0211) | 0.0220  (0.0211) | 0.0220  (0.0211) | 0.0213  (0.0211) | 0.0218  (0.0211) |
| Sorghum | 0.0036  (0.0071) | 0.0047  (0.0071) | 0.0040  (0.0071) | 0.0043  (0.0071) | 0.0030  (0.0071) | 0.0036  (0.0071) |
| Rice | 0.0044  (0.0047) | 0.0053  (0.0047) | 0.0044  (0.0047) | 0.0060  (0.0048) | 0.0054  (0.0048) | 0.0044  (0.0047) |
| Barley | -0.0112  (0.0224) | -0.0084  (0.0224) | -0.0093  (0.0223) | -0.0084  (0.0224) | -0.0113  (0.0224) | -0.0113  (0.0224) |
| Spring wheat | 0.0027  (0.0064) | 0.0042  (0.0064) | 0.0037  (0.0064) | 0.0041  (0.0064) | 0.0014  (0.0064) | 0.0025  (0.0064) |
| Winter wheat | 0.0006  (0.0055) | 0.0030  (0.0056) | 0.0015  (0.0055) | 0.0027  (0.0056) | 0.0015  (0.0055) | 0.0003  (0.0055) |
| Average temperature | 0.0062\*  (0.0032) | 0.0063\*  (0.0032) | 0.0060\*  (0.0032) | 0.0063\*  (0.0033) | 0.0040  (0.0035) | 0.0061\*  (0.0032) |
| Average precipitation | 0.0002  (0.0003) | 0.0001  (0.0003) | 0.0002  (0.0002) | 0.0001  (0.0003) | 0.0001  (0.0003) | 0.0002  (0.0003) |
| Natural |  | 0.0016\*\*  (0.0008) |  |  |  |  |
| Natural in bloom |  |  | 0.0013\*  (0.0007) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0000\*\*  (0.0000) |  |  |
| NDVI |  |  |  |  | 0.0021\*  (0.0012) |  |
| NDVI in bloom |  |  |  |  |  | 0.0001  (0.0002) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 925 | 925 | 925 | 912 | 912 | 925 |
| R-squared | 0.1367 | 0.1405 | 0.1403 | 0.1390 | 0.1380 | 0.1370 |

Nosema Detection OLS Full Crop Models with Percentage, Forage and Weather Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Nosema\_d | (1) | (2) | (3) | (4) | (5) | (6) |
| Corn | 0.0078  (0.0094) | 0.0082  (0.0094) | 0.0079  (0.0094) | 0.0069  (0.0097) | 0.0055  (0.0097) | 0.0073  (0.0097) |
| Soy | 0.0003  (0.0073) | 0.0006  (0.0073) | 0.0004  (0.0073) | 0.0018  (0.0075) | 0.0011  (0.0075) | 0.0007  (0.0075) |
| Cotton | -0.0171\*\*  (0.0081) | -0.0172\*\*  (0.0081) | -0.0167\*\*  (0.0082) | -0.0176\*\*  (0.0084) | -0.0168\*\*  (0.0084) | -0.0176\*\*  (0.0085) |
| Canola | 0.0209  (0.0187) | 0.0223  (0.0189) | 0.0208  (0.0188) | 0.0211  (0.0191) | 0.0162  (0.0191) | 0.0211  (0.0191) |
| Sorghum | 0.0010  (0.0106) | 0.0013  (0.0106) | 0.0010  (0.0106) | 0.0013  (0.0108) | 0.0006  (0.0108) | 0.0010  (0.0108) |
| Rice | -0.0012  (0.0127) | 0.0003  (0.0128) | -0.0020  (0.0128) | 0.0022  (0.0129) | -0.0004  (0.0128) | -0.0002  (0.0130) |
| Barley | -0.0038  (0.0140) | -0.0045  (0.0140) | -0.0036  (0.0140) | -0.0110  (0.0148) | -0.0098  (0.0148) | -0.0094  (0.0148) |
| Spring wheat | 0.0082  (0.0144) | 0.0091  (0.0145) | 0.0080  (0.0144) | 0.0154  (0.0148) | 0.0117  (0.0148) | 0.0154  (0.0148) |
| Winter wheat | -0.0026  (0.0071) | -0.0020  (0.0071) | -0.0023  (0.0071) | 0.0014  (0.0074) | 0.0021  (0.0074) | -0.0011  (0.0073) |
| Natural |  | 0.0097  (0.0123) |  |  |  |  |
| Natural during bloom |  |  | -0.0010  (0.0024) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0001\*\*  (0.0000) |  |  |
| ndvi |  |  |  |  | 0.0026\*\*  (0.0010) |  |
| NDVI in bloom |  |  |  |  |  | -0.0025  (0.0075) |
|  |  |  |  |  |  |  |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 1038 | 1038 | 1038 | 971 | 971 | 971 |
| R-squared | 0.1237 | 0.1242 | 0.1238 | 0.1272 | 0.1288 | 0.1230 |

Nosema Detection OLS Full Crop Models with Natural Log and Forage Controls

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Nosema\_d | (7) | (8) | (9) | (10) | (11) | (12) |
| Corn | 0.0137  (0.0100) | 0.0142  (0.0101) | 0.0136  (0.0101) | 0.0136  (0.0101) | 0.0128  (0.0102) | 0.0139  (0.0101) |
| Soy | -0.0023  (0.0078) | -0.0015  (0.0078) | -0.0026  (0.0078) | -0.0005  (0.0079) | -0.0012  (0.0079) | -0.0024  (0.0078) |
| Cotton | -0.0180\*\*  (0.0085) | -0.0182\*\*  (0.0085) | -0.0190\*\*  (0.0086) | -0.0174\*\*  (0.0087) | -0.0169\*  (0.0088) | -0.0186\*\*  (0.0088) |
| Canola | 0.0244  (0.0191) | 0.0272  (0.0192) | 0.0245  (0.0191) | 0.0233  (0.0191) | 0.0201  (0.0192) | 0.0226  (0.0192) |
| Sorghum | 0.0018  (0.0110) | -0.0051  (0.0110) | 0.0022  (0.0110) | 0.0018  (0.0110) | 0.0015  (0.0110) | 0.0013  (0.0111) |
| Rice | -0.0075  (0.0136) | -0.0051  (0.0137) | -0.0058  (0.0138) | -0.0050  (0.0138) | -0.0070  (0.0138) | -0.0054  (0.0139) |
| Barley | -0.0166  (0.0148) | -0.0181  (0.0148) | -0.0170  (0.0148) | -0.0143  (0.0150) | -0.0131  (0.0149) | -0.0131  (0.0150) |
| Spring wheat | 0.0089  (0.0148) | 0.0104  (0..0148) | 0.0092  (0.0148) | 0.0089  (0.0148) | 0.0069  (0.0149) | 0.0087  (0.0148) |
| Winter wheat | -0.0005  (0.0075) | 0.0003  (0.0075) | -0.0010  (0.0075) | 0.0012  (0.0076) | 0.0008  (0.0076) | -0.0010  (0.0076) |
| Average temperature | 0.0065\*\*  (0.0032) | 0.0065\*\*  (0.0032) | 0.0063\*  (0.0033) | 0.0054  (0.0034) | 0.0049  (0.0036) | 0.0066\*\*  (0.0033) |
| Average precipitation | 0.0001  (0.0003) | 0.0001  (0.0003) | 0.0002  (0.0003) | 0.0000  (0.0003) | 0.0001  (0.0003) | 0.0002  (0.0003) |
| Natural |  | 0.0168  (0.0129) |  |  |  |  |
| Natural in bloom |  |  | 0.0022  (0.0027) |  |  |  |
| Natural\*ndvi |  |  |  | 0.0001\*  (0.0000) |  |  |
| NDVI |  |  |  |  | 0.0016  (0.0012) |  |
| NDVI in bloom |  |  |  |  |  | 0.0045  (0.0080) |
| Month | Y | Y | Y | Y | Y | Y |
| Month^2 | Y | Y | Y | Y | Y | Y |
| Region FE | Y | Y | Y | Y | Y | Y |
| Year FE | Y | Y | Y | Y | Y | Y |
| N | 925 | 925 | 925 | 912 | 912 | 912 |
| R-squared | 0.1378 | 0.1394 | 0.1385 | 0.1389 | 0.1379 | 0.1364 |

Nosema Detection OLS Full Crop Models with Natural Log, Forage and Weather Controls