**Supplementary Material A1** GIS-calculated cattle density categories for each presence and each absence quadrants. In boldface, the proportionally dominant cattle density category in each quadrant. For position of each quadrants, see Appendix1.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| quadrant number | cattle density classes (% of occurrence in each quadrant) | | | | | | | | |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **PRESENCE QUADRANTS** | | |  |  |  |  |  |  |  |
| 1 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 2 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 3 | **55.25778** | 23.06749 | 6.112672 | 8.560262 | 7.001797 | 0 | 0 | 0 |  |
| 4 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 5 | **37.85879** | 6.187936 | 13.91822 | 18.42406 | 23.36167 | 0.249324 | 0 | 0 |  |
| 6 | **92.71923** | 7.280775 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 7 | **83.00761** | 16.99239 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 8 | 2.530214 | 1.312842 | 10.57052 | **64.61585** | 18.49138 | 2.479191 | 0 | 0 |  |
| 9 | 15.90959 | 29.21833 | **38.36898** | 2.494564 | 14.00854 | 0 | 0 | 0 |  |
| 10 | **55.05792** | 42.45198 | 0 | 0 | 0 | 0 | 0 | 2.490099 |  |
| 11 | 0.499251 | 0 | 0 | **59.05224** | 8.663558 | 31.28604 | 0.498918 | 0 |  |
| 12 | 0.498932 | 0.040628 | 1.575505 | **61.19601** | 22.93241 | 13.75651 | 0 | 0 |  |
| 13 | **54.0874** | 0.248752 | 0.970935 | 19.48557 | 25.20734 | 0 | 0 | 0 |  |
| 14 | **92.69245** | 0.172261 | 1.86067 | 2.48849 | 0.500904 | 2.28522 | 0 | 0 |  |
| 15 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 16 | **96.50455** | 0 | 1.997801 | 0 | 1.497649 | 0 | 0 | 0 |  |
| 17 | **98.25247** | 1.747534 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 18 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 19 | **81.74013** | 0.497988 | 0.498978 | 8.637207 | 8.625697 | 0 | 0 | 0 |  |
| 20 | **73.19712** | 5.40488 | 2.920376 | 4.251821 | 14.2258 | 0 | 0 | 0 |  |
| 21 | **73.25948** | 24.5298 | 0.416938 | 0 | 1.793788 | 0 | 0 | 0 |  |
| 22 | **73.19712** | 5.40488 | 2.920376 | 4.251821 | 14.2258 | 0 | 0 | 0 |  |
| 23 | **37.67744** | 0.757977 | 33.62212 | 27.94247 | 0 | 0 | 0 | 0 |  |
| 24 | 24.95352 | 13.20349 | 1.244215 | 30.65021 | **29.94857** | 0 | 0 | 0 |  |
| 25 | **65.856** | 18.82117 | 0.670643 | 13.06182 | 1.590371 | 0 | 0 | 0 |  |
| 26 | 6 | 21.04169 | 3.738119 | **61.48249** | 1.066213 | 6.937525 | 0 | 0 |  |
| 27 | **65.856** | 18.82117 | 0.670643 | 13.06182 | 1.590371 |  |  |  |  |
| 28 | 26.87695 | 3.358363 | 22.53829 | 14.90402 | **32.32238** | 0 | 0 | 0 |  |
| 29 | 17.85976 | 0.249024 | 2.491929 | 24.15411 | **55.24518** | 0 | 0 | 0 |  |
| 30 | 7.286799 | 3.022459 | 15.35057 | 23.54731 | **50.79286** | 0 | 0 | 0 |  |
| 31 | 9.153955 | 14.52839 | 17.26571 | 7.225427 | **51.82652** | 0 | 0 | 0 |  |
| 32 | 4.144698 | 26.94034 | **29.72315** | 10.50546 | 28.68635 | 0 | 0 | 0 |  |
| 33 | 1.037691 | 14.75686 | 28.86544 | 20.10917 | **34.73266** | 0.498191 | 0 | 0 |  |
| 34 | 0 | 0.995951 | 16.05525 | 5.000415 | **77.94839** | 0 | 0 | 0 |  |
| 35 | 1.879997 | 8.60606 | 24.67365 | **36.4412** | 25.65809 | 2.741007 | 0 | 0 |  |
| 36 | 1.004142 | 2.602838 | 10.40588 | **50.76764** | 34.2209 | 0.998608 | 0 | 0 |  |
| 37 | **50.94421** | 29.38494 | 12.95102 | 1.24488 | 4.528223 | 0.697302 | 0.249425 | 0 |  |
| 38 | 28.25347 | 20.33753 | **32.67864** | 0.249672 | 18.48069 | 0 | 0 | 0 |  |
| 39 | 5.506193 | **46.16531** | 32.88004 | 0.249701 | 15.19876 | 0 | 0 | 0 |  |
| 40 | 30.36489 | **54.3949** | 5.908811 | 0.524835 | 7.756573 | 0 | 0 | 1.04999 |  |
| 41 | **74.65766** | 24.77615 | 0.249582 | 0 | 0.316611 | 0 | 0 | 0 |  |
| 42 | **79.86823** | 19.5178 | 0.61397 | 0 | 0 | 0 | 0 | 0 |  |
| 43 | **87.69564** | 11.58182 | 0.139581 | 0 | 0.582964 | 0 | 0 | 0 |  |
| 44 | **89.40361** | 10.59639 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 45 | 39.57292 | **60.0818** | 0 | 0 | 0 | 0 | 0 | 0.345289 |  |
| 46 | **94.78908** | 5.210919 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 47 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 48 | **86.48002** | 7.739171 | 0 | 0 | 0 | 0 | 0 | 5.780805 |  |
| 49 | 40.1398 | **58.8622** | 0.998004 | 0 | 0 | 0 | 0 | 0 |  |
| 50 | **47.53653** | 0.49795 | 0.351887 | 44.52359 | 6.936664 | 0 | 0 | 0.153374 |  |
| 51 | 5.825328 | 1.590672 | 5.729988 | 32.65692 | **49.6101** | 4.337714 | 0.249278 | 0 |  |
| 52 | 13.23404 | **69.45458** | 16.56252 | 0 | 0.748855 | 0 | 0 | 0 |  |
| 53 | 27.12714 | **41.9523** | 23.70619 | 2.03996 | 4.178628 | 0 | 0.248904 | 0.74688 |  |
| 54 | **99.42951** | 0.570486 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 55 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 56 | **98.00499** | 0 | 0 | 0 | 0 | 1.995007 | 0 | 0 |  |
| 57 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 58 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 59 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 60 | **57.41894** | 40.41395 | 2.16711 | 0 | 0 | 0 | 0 | 0 |  |
| 61 | **73.54043** | 24.3891 | 1.072922 | 0.997548 | 0 | 0 | 0 | 0 |  |
| 62 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 63 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 64 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 65 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 66 | **99.992** | 0 | 0 | 0 | 0 | 0.008461 | 0 | 0 |  |
| 67 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 68 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 69 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 70 | **56.55556** | 38.18223 | 5.262213 | 0 | 0 | 0 | 0 | 0 |  |
| 71 | 0.80717 | 0.060657 | **56.39713** | 16.57262 | 20.06419 | 6.098229 | 0 | 0 |  |
| 72 | 3.352831 | 0.747938 | **64.47332** | 27.98725 | 3.189044 | 0.249615 | 0 | 0 |  |
| 73 | 0.921389 | 4.301016 | 29.05967 | 23.52123 | **39.37863** | 2.436713 | 0.381347 | 0 |  |
| 74 | 29.23908 | **58.80123** | 11.50405 | 0 | 0.455632 | 0 | 0 | 0 |  |
| 75 | 0.996258 | 4.490386 | 15.62669 | 19.12874 | **59.75793** | 0 | 0 | 0 |  |
| 76 | 3.69807 | 34.61327 | **45.18176** | 0 | 16.50691 | 0 | 0 | 0 |  |
| 77 | 25.78611 | 6.608025 | **32.60193** | 5.181924 | 29.82201 | 0 | 0 | 0 |  |
| 78 | 4.080884 | 14.97748 | **42.00817** | 0.87976 | 38.05371 | 0 | 0 | 0 |  |
| 79 | **96.13199** | 1.4362 | 2.43181 | 0 | 0 | 0 | 0 | 0 |  |
| 80 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 81 | 2.101616 | 2.512041 | 5.245259 | **50.30213** | 20.64471 | 19.19424 | 0 | 0 |  |
| 82 | **48.21419** | 2.454288 | 19.51367 | 24.94836 | 4.869496 | 0 | 0 | 0 |  |
| **ABSENCE QUADRANTS** | |  |  |  |  |  |  |  |  |
| 83 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 84 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 85 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 86 | 2.483914 | 24.77607 | 35.27713 | 1.121796 | **36.34109** | 0 | 0 | 0 |  |
| 87 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 88 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 89 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 90 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 91 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 92 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 93 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 94 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 95 | 3.428006 | 0.248846 | 0.995487 | **61.59209** | 33.73557 | 0 | 0 | 0 |  |
| 96 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 97 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 98 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 99 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 100 | **97.81694** | 0 | 0 | 0 | 0 | 0 | 2.183058 | 0 |  |
| 101 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 102 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 103 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 104 | **88.00112** | 8.664656 | 0.771225 | 0.99714 | 1.565859 | 0 | 0 | 0 |  |
| 105 | **69.87905** | 11.36674 | 2.489929 | 6.148884 | 5.354254 | 0.527805 | 2.738748 | 1.494596 |  |
| 106 | 2.971912 | **50.47083** | 29.25349 | 10.93113 | 5.932382 | 0.190645 | 0 | 0.24962 |  |
| 107 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 108 | **99.82952** | 0.170476 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 109 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 110 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 111 | 0 | **46.04547** | 44.406 | 0.433885 | 9.114647 | 0 | 0 | 0 |  |
| 112 | 7.056563 | **76.51226** | 15.5006 | 0 | 0.930584 | 0 | 0 | 0 |  |
| 113 | **62.97182** | 37.02818 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 114 | 22.31868 | **73.12234** | 4.55898 | 0 | 0 | 0 | 0 | 0 |  |
| 115 | 47.43832 | 0 | 0 | **49.18179** | 2.381542 | 0.99835 | 0 | 0 |  |
| 116 | 12.37201 | **46.73847** | 35.5152 | 0 | 5.374316 | 0 | 0 | 0 |  |
| 117 | 1.220565 | 1.032691 | 8.206176 | **44.21381** | 37.34664 | 7.882622 | 0.097495 | 0 |  |
| 118 | 0.996607 | **43.04391** | 40.68118 | 0.249709 | 15.02859 | 0 | 0 | 0 |  |
| 119 | 2.168747 | 4.079173 | 20.92664 | 28.72247 | **38.98758** | 4.118122 | 0.997271 | 0 |  |
| 120 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 121 | **68.85319** | 30.78883 | 0.357987 | 0 | 0 | 0 | 0 | 0 |  |
| 122 | 5.019648 | **60.12746** | 2.243465 | 7.534115 | 24.16777 | 0.907543 | 0 | 0 |  |
| 123 | 0.443327 | 0 | 2.414571 | 40.62684 | **54.85247** | 1.662796 | 0 | 0 |  |
| 124 | 0.498394 | 0 | 2.504762 | **74.54646** | 22.45038 | 0 | 0 | 0 |  |
| 125 | 2.671103 | 0.497846 | 10.47831 | 13.48934 | **72.8634** | 0 | 0 | 0 |  |
| 126 | 8.448394 | 0.249672 | 3.23306 | **58.32738** | 29.74149 | 0 | 0 | 0 |  |
| 127 | 3.735046 | 1.143034 | **79.63653** | 15.48539 | 0 | 0 | 0 | 0 |  |
| 128 | 0.249209 | 0.183931 | 12.92486 | **68.17847** | 5.142013 | 13.32151 | 0 | 0 |  |
| 129 | 7.190717 | 2.240733 | 3.244798 | **45.88829** | 41.43547 | 0 | 0 | 0 |  |
| 130 | 2.96887 | 0 | 19.19246 | 7.678957 | **70.15971** | 0 | 0 | 0 |  |
| 131 | 22.04167 | **38.91861** | 32.20944 | 0.598576 | 6.231706 | 0 | 0 | 0 |  |
| 132 | 36.46153 | 0.498017 | 1.36462 | 20.63359 | **41.04225** | 0 | 0 | 0 |  |
| 133 | **66.70337** | 25.05793 | 4.010014 | 0.168615 | 4.060074 | 0 | 0 | 0 |  |
| 134 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 135 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 136 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 137 | **69.60415** | 29.56901 | 0.499576 | 0 | 0.327263 | 0 | 0 | 0 |  |
| 138 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 139 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 140 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 141 | **99.75031** | 0 | 0 | 0 | 0 | 0 | 0 | 0.24969 |  |
| 142 | 0 | 2.957186 | 24.51334 | 1.495762 | **71.03371** | 0 | 0 | 0 |  |
| 143 | 2.571641 | 0 | 8.678829 | **47.62881** | 39.3989 | 1.721824 | 0 | 0 |  |
| 144 | 5.819936 | 13.67991 | **29.47135** | 20.52347 | 27.36623 | 3.139099 | 0 | 0 |  |
| 145 | 17.4052 | 6.166775 | **49.75425** | 0 | 26.67377 | 0 | 0 | 0 |  |
| 146 | 0 | 0 | 10.47836 | 2.714324 | **60.85897** | 25.94834 | 0 | 0 |  |
| 147 | 1.045441 | 13.57797 | **40.83215** | 8.130498 | 36.41394 | 0 | 0 | 0 |  |
| 148 | 0 | 4.959318 | **39.84361** | 0 | 55.19708 | 0 | 0 | 0 |  |
| 149 | 2.925284 | 0.867476 | 5.272346 | **56.62729** | 34.0902 | 0.217405 | 0 | 0 |  |
| 150 | 1.059293 | 0 | 0 | **46.28121** | 0 | 52.6595 | 0 | 0 |  |
| 151 | 0.747127 | 4.39942 | 3.768309 | **58.28262** | 17.37584 | 15.42668 | 0 | 0 |  |
| 152 | 0 | 0 | 0 | **44.30103** | 55.69897 | 0 | 0 | 0 |  |
| 153 | 1.993287 | 4.400752 | 22.68261 | 11.86556 | **59.05779** | 0 | 0 | 0 |  |
| 154 | 3.960445 | 1.493677 | 0 | **46.71278** | 12.64275 | 30.21005 | 4.980297 | 0 |  |
| 155 | 0.49882 | 0 | 7.101809 | 11.92475 | **80.47463** | 0 | 0 | 0 |  |
| 156 | 1.606422 | 0 | 2.052619 | 30.97562 | **65.36534** | 0 | 0 | 0 |  |
| 157 | 1.644645 | 0 | 0.497694 | **38.46826** | 32.17408 | 27.21532 | 0 | 0 |  |
| 158 | 0.499174 | 0 | 0.748371 | **53.33266** | 42.71477 | 2.705031 | 0 | 0 |  |
| 159 | 2.681781 | 20.8826 | **46.4427** | 2.579937 | 27.41298 | 0 | 0 | 0 |  |
| 160 | 19.90624 | 17.36833 | 23.24894 | 4.983566 | **34.49292** | 0 | 0 | 0 |  |
| 161 | 12.20033 | 0 | 0 | **61.32284** | 10.87347 | 13.35941 | 1.745018 | 0.498937 |  |
| 162 | 5.628237 | 0 | 2.789492 | **38.27905** | 24.61394 | 21.71122 | 5.732411 | 1.245657 |  |
| 163 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |
| 164 | **100** | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |