

Figure 1: Scenario 1: Changes of a seed column after four model years (only four years are illustrated because of scales) in three rotations (2-year, 3-year, and 4-year) crossed with two corn weed management programs (conventional and low herbicide). The model started at year 0 with 1000 and 0 seeds per squared meter at the top (0-2 cm) and bottom (2-20 cm) strata, respectively. The red horizontal line shows the number of seeds at the top stratum at the begining of the model clock. The annualized population growth rates are followed by their variances in brackets. The models years are followed by the main crop species names’ abbreviations: C - corn, S - soybean, O - oat, and A - alfalfa.

Table 1: Scenario 2 - Elasticity of population growth rates in three rotations crossed with two corn weed management programs to lower-level demographic parameters

| Crop\_ID | Corn\_weed\_management | st1\_1\* | st2\_1\* | st1\_2\* | st2\_2\* | 1-sum(e)§ | sss\_1† | sss\_2† | f\_1⁋ | f\_2⁋ | f\_3⁋ | f\_4⁋ | f\_5⁋ | f\_6⁋ | ft1\_1⌇ | ft2\_1⌇ | ft1\_2⌇ | ft2\_2⌇ | wss\_1⍑ | wss\_2⍑ |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C2 | conv | 1,466.84 | 1,437.21 | 0.12 | 0.11 | 1,522.79 | 0.05 | 0.02 | **4,099,185,668.80** | 990,125,323 | 237,420,871.69 | 50,445,968.31 | 22,152,907.95 | 28,440,558.71 | 0.04 | 0.05 | 0.07 | 0.08 | 1,407.87 | 0.02 |
| C2 | low | 1,040.05 | 1,019.03 | 0.08 | 0.08 | 1,075.11 | 0.03 | 0.02 | **2,766,736,655.89** | 668,282,983 | 160,246,712.80 | 34,048,399.11 | 14,952,058.14 | 19,195,894.66 | 0.03 | 0.04 | 0.05 | 0.05 | 998.23 | 0.01 |
| S2 | conv | 1,224.96 | 1,199.30 | 855.64 | 837.72 | 2,092.52 | 0.99 | 0.43 | 2,093,885,714.17 | **14,238,156,534** | 711,346,410.36 | 517,111,697.67 | 414,505,814.44 | 395,211,907.50 | 1.47 | 0.83 | 1.00 | 0.57 | 1,684.99 | 0.00 |
| S2 | low | 868.54 | 850.35 | 606.68 | 593.98 | 1,513.48 | 0.70 | 0.30 | 1,228,712,929.01 | **8,355,091,637** | 417,425,137.15 | 303,446,279.03 | 243,236,127.89 | 231,914,271.71 | 1.04 | 0.59 | 0.71 | 0.40 | 1,194.72 | 0.00 |
| C3 | conv | 12.64 | 67.32 | 687.06 | 3,659.78 | 1,052.30 | 0.03 | 0.02 | 5,592,860,407.22 | **10,241,029,161** | 6,553,794,288.93 | 4,170,959,828.12 | 274,584,905.82 | 57,989,495.69 | 4.16 | 6.44 | 2.83 | 4.39 | 4,051.81 | 0.00 |
| C3 | low | 110.13 | 586.62 | 5,987.41 | 31,893.50 | 9,066.99 | 0.29 | 0.19 | 560,845,021.29 | **1,026,957,549** | 657,206,264.75 | 418,258,616.04 | 27,535,029.69 | 5,815,113.84 | 36.23 | 56.14 | 24.67 | 38.24 | 35,309.85 | 0.00 |
| S3 | conv | 3,560.69 | 2,425.33 | 0.17 | 0.12 | 3,767.47 | 0.00 | 0.00 | **4,430,424,819.92** | 884,087,490 | 219,595,694.18 | 18,713,992.16 | 38,195,564.95 | 83,849,529.43 | 0.03 | 0.05 | 0.05 | 0.07 | 4.89 | 3.41 |
| S3 | low | 31,029.99 | 21,135.75 | 1.49 | 1.02 | 33,065.92 | 0.00 | 0.00 | **97,536,117,996.12** | 19,463,249,057 | 4,834,414,849.40 | 411,989,870.50 | 840,878,083.09 | 1,845,953,363.11 | 0.26 | 0.40 | 0.40 | 0.60 | 42.66 | 29.74 |
| O3 | conv | 5.07 | 7.27 | 3.57 | 5.11 | 10.31 | 0.00 | 0.00 | 34,174,840.90 | **303,196,630** | 370,916.67 | 5,688,132.59 | 354,078.03 | 354,071.33 | 0.00 | 0.04 | 0.01 | 0.21 | 0.93 | 3,911.43 |
| O3 | low | 44.21 | 63.33 | 31.11 | 44.57 | 89.86 | 0.00 | 0.00 | 2,873,761.48 | **25,495,797** | 31,190.37 | 478,314.92 | 29,774.41 | 29,773.85 | 0.02 | 0.34 | 0.13 | 1.83 | 8.09 | 34,086.54 |
| C4 | conv | 0.02 | 0.02 | 1.23 | 1.21 | 1.25 | 0.01 | 0.00 | 732,440,602.93 | **1,645,017,490** | 15,670,814.43 | 1,247,105,405.17 | 61,862,197.17 | 18,259,659.49 | 0.01 | 0.01 | 0.00 | 0.00 | 1.84 | 0.00 |
| C4 | low | 0.03 | 0.03 | 1.82 | 1.79 | 1.72 | 0.01 | 0.00 | 4,514,711,997.21 | **10,139,771,288** | 96,593,790.20 | 7,687,069,384.22 | 381,314,201.65 | 112,551,247.76 | 0.02 | 0.02 | 0.00 | 0.00 | 2.74 | 0.00 |
| S4 | conv | 1.66 | 1.63 | 0.19 | 0.18 | 1.73 | 0.12 | 0.05 | 30,614,999.62 | **84,392,111** | 57,466,194.44 | 33,438,761.46 | 12,281,030.64 | 2,230,608.04 | 0.18 | 0.10 | 0.12 | 0.07 | 15,656.18 | 0.00 |
| S4 | low | 2.47 | 2.42 | 0.27 | 0.27 | 2.56 | 0.18 | 0.08 | 32,141,403.63 | **88,599,736** | 60,331,346.52 | 35,105,952.72 | 12,893,338.81 | 2,341,821.80 | 0.27 | 0.15 | 0.18 | 0.11 | 23,234.04 | 0.00 |
| O4 | conv | 13,622.02 | 13,336.57 | 127.87 | 125.19 | 12,781.83 | 18.59 | 39.29 | **8,360,399.81** | 1,850,989 | 241,204.83 | 335,121.62 | 335,121.62 | 361,855.36 | 35.22 | 43.38 | 52.93 | 65.20 | 286.31 | 34.27 |
| O4 | low | 20,215.32 | 19,791.70 | 189.75 | 185.78 | 18,968.23 | 27.58 | 58.30 | **6,486,555.88** | 1,436,120 | 187,142.80 | 260,009.71 | 260,009.71 | 280,751.53 | 52.26 | 64.38 | 78.55 | 96.76 | 424.88 | 50.85 |
| A4 | conv | 684.84 | 92.63 | 478.10 | 64.66 | 578.30 | 0.03 | 0.01 | 1,387,435.20 | **11,740,397** | 101,418.96 | 81,652.35 | 69,727.16 | 67,827.97 | 0.00 | 0.05 | 0.01 | 0.26 | 0.02 | 0.01 |
| A4 | low | 1,016.31 | 137.46 | 709.51 | 95.96 | 883.03 | 0.05 | 0.02 | 36,200.67 | **306,328** | 2,646.20 | 2,130.46 | 1,819.31 | 1,769.75 | 0.00 | 0.07 | 0.01 | 0.38 | 0.03 | 0.01 |
| \*st\_ij: the probability of seed movement from soil stratum i to j by pre-planting tillage | | | | | | | | | | | | | | | | | | | | |
| §1-sum(e): the probability of non-emerging seeds in the top (0-2 cm) soil stratum | | | | | | | | | | | | | | | | | | | | |
| †sss\_1 and sss\_2: the summer survival probabilities of the seeds in the top (0-2 cm) and bottom (2-20 cm) soil strata | | | | | | | | | | | | | | | | | | | | |
| ⁋f\_1 though f\_6: the individual fecundity of mature plants in cohorts 1 through 6 | | | | | | | | | | | | | | | | | | | | |
| ⌇ft\_ij: the probability of seed movement from soil stratum i to j by post-harvest tillage | | | | | | | | | | | | | | | | | | | | |
| ⍑wss\_1 and wss\_2: the overwinter survival probabilities of seeds in the top (0-2 cm) and bottom (2-20 cm) soil strata | | | | | | | | | | | | | | | | | | | | |
| All-zero columns are excluded. In Crop\_ID: C2 - corn in the 2 year rotation, S2 - soybean in the 2-year rotation, C3 - corn in the 3-year rotation, S3 - soybean in the 3-year rotation, O3 - oat intercroped with red clover in the 3-year rotation, C4 - corn in the 4-year rotation, S4 - soybean in the 4-year rotation, O4 - oat intercropped with alfalfa in the 4-year rotation, and A4 - alfalfa in the 4-year rotation. | | | | | | | | | | | | | | | | | | | | |