*Table S-2, Evolution of components of the annual balance of carbon emissions (t) in the northern region by technological trajectory,*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Terms of the Balance | Year | Peasant production systemsconverging to: | Enterprise production systems converging to: | Total |
| Intensive agriculture (perennial crops and/or dairy)(T1) | Agro-forestry(T2) | Livestockfor meat(T3) | Livestockfor meat(T4) | Annual crops (soybeans and corn)1 (T7) | Plantation(perennial crops) (T5) | $$E\_{(t)}^{\pm }$$ | Adjusted Total 2$$E\_{(t)}^{A}$$ |
| Emission | 1990 | 446,614,151 | 128,331,411 | 550,701,427 | 2,497,094,076 | 505,466,834 | 251,259,811 | 4,379,467,710 | 4,379,467,710 |
| 1991 | 486,128,874 | 130,579,153 | 567,094,639 | 2,745,791,967 | 511,998,059 | 145,816,998 | 4,587,409,690 | 4,587,409,690 |
| 1992 | 510,109,884 | 131,818,530 | 584,442,664 | 2,920,897,086 | 423,087,610 | 134,136,593 | 4,704,492,367 | 4,704,492,367 |
| 1993 | 557,184,064 | 141,766,509 | 625,374,494 | 3,233,984,803 | 233,481,421 | 187,914,340 | 4,979,705,631 | 4,979,705,631 |
| 1994 | 590,284,958 | 145,288,783 | 639,121,991 | 3,319,766,904 | 253,611,206 | 147,774,125 | 5,095,847,967 | 5,095,847,967 |
| 1995 | 638,618,404 | 148,552,471 | 660,207,824 | 3,441,718,437 | 253,671,411 | 151,207,497 | 5,293,976,044 | 5,293,976,044 |
| 1996 | 680,508,974 | 153,304,074 | 684,013,079 | 3,234,192,229 | 325,765,471 | 166,655,551 | 5,244,439,378 | 5,293,976,044 |
| 1997 | 696,972,199 | 154,543,071 | 669,636,232 | 3,071,774,498 | 379,226,897 | 170,393,912 | 5,142,546,809 | 5,293,976,044 |
| 1998 | 732,406,690 | 157,635,924 | 660,385,476 | 2,807,435,461 | 607,989,243 | 166,783,861 | 5,132,636,655 | 5,293,976,044 |
| 1999 | 748,441,091 | 167,894,842 | 655,062,216 | 2,731,093,521 | 611,957,149 | 162,741,206 | 5,077,190,025 | 5,293,976,044 |
| 2000 | 757,156,565 | 169,473,577 | 671,341,622 | 2,873,747,153 | 457,342,950 | 162,553,777 | 5,091,615,644 | 5,308,401,663 |
| 2001 | 798,155,736 | 178,314,513 | 690,002,173 | 2,880,872,423 | 529,319,850 | 177,701,716 | 5,254,366,411 | 5,471,152,430 |
| 2002 | 880,739,504 | 182,926,226 | 686,039,927 | 2,911,711,737 | 533,007,075 | 197,731,619 | 5,392,156,088 | 5,608,942,107 |
| 2003 | 973,994,411 | 195,977,029 | 688,245,736 | 2,807,424,236 | 692,174,098 | 213,219,876 | 5,571,035,386 | 5,787,821,405 |
| 2004 | 1,067,371,454 | 207,423,691 | 711,162,472 | 2,938,976,030 | 773,673,457 | 226,748,042 | 5,925,355,146 | 6,142,141,165 |
| 2005 | 1,103,239,033 | 224,317,086 | 712,282,224 | 2,945,561,894 | 722,289,428 | 228,990,756 | 5,936,680,421 | 6,153,466,440 |
| 2006 | 1,080,724,868 | 217,941,853 | 673,542,459 | 2,832,106,412 | 630,409,266 | 226,790,654 | 5,661,515,512 | 6,153,466,440 |
| 2007 | 1,025,453,084 | 216,475,110 | 671,323,313 | 2,625,751,998 | 700,200,517 | 210,849,088 | 5,450,053,110 | 6,153,466,440 |
| 2008 | 1,043,745,335 | 223,760,972 | 690,085,558 | 2,568,005,177 | 809,260,874 | 212,801,501 | 5,547,659,417 | 6,251,072,747 |
| 2009 | 1,074,012,905 | 219,713,303 | 696,953,600 | 2,511,093,579 | 918,134,157 | 226,227,004 | 5,646,134,548 | 6,349,547,878 |
| 2010 | 1,090,253,790 | 214,063,851 | 712,287,555 | 2,751,709,409 | 783,487,812 | 228,761,167 | 5,780,563,584 | 6,483,976,914 |
| 2011 | 1,119,687,726 | 223,193,584 | 728,094,350 | 2,848,735,137 | 740,769,297 | 229,594,238 | 5,890,074,332 | 6,593,487,662 |
| Sequestration | 1990 | 35,311,122 | 15,846,540 | 29,881,724 | 105,224,894 | 23,616,427 | 16,545,602 | 226,426,309 | 226,426,309 |
| 1991 | 36,572,929 | 15,942,696 | 28,755,721 | 113,440,925 | 23,316,703 | 10,313,094 | 228,342,068 | 228,342,068 |
| 1992 | 37,231,125 | 15,836,543 | 29,237,999 | 121,396,057 | 18,065,123 | 9,219,233 | 230,986,080 | 230,986,080 |
| 1993 | 38,707,734 | 16,588,240 | 30,648,689 | 132,382,149 | 10,206,076 | 11,574,165 | 240,107,053 | 240,107,053 |
| 1994 | 39,822,264 | 15,104,172 | 31,023,508 | 135,146,953 | 10,860,778 | 9,020,073 | 240,977,748 | 240,977,748 |
| 1995 | 41,396,334 | 15,418,703 | 31,876,453 | 138,177,065 | 11,733,852 | 8,620,114 | 247,222,521 | 247,222,521 |
| 1996 | 45,255,035 | 18,852,692 | 34,424,541 | 128,857,317 | 15,765,851 | 11,497,718 | 254,653,154 | 254,653,154 |
| 1997 | 45,642,973 | 18,747,953 | 33,890,834 | 123,142,424 | 17,866,485 | 11,417,291 | 250,707,960 | 254,653,154 |
| 1998 | 47,130,629 | 18,895,203 | 34,328,300 | 112,461,613 | 28,710,762 | 11,129,514 | 252,656,021 | 256,601,215 |
| 1999 | 49,960,191 | 18,723,702 | 34,620,346 | 111,121,715 | 28,826,186 | 10,151,283 | 253,403,423 | 257,348,617 |
| 2000 | 51,888,151 | 19,182,165 | 35,404,604 | 117,882,833 | 21,774,361 | 10,134,953 | 256,267,067 | 260,212,261 |
| 2001 | 53,370,546 | 19,099,800 | 35,925,673 | 116,742,470 | 25,654,400 | 10,469,905 | 261,262,794 | 265,207,988 |
| 2002 | 55,493,130 | 21,097,873 | 35,994,578 | 117,349,775 | 25,471,496 | 12,046,599 | 267,453,451 | 271,398,645 |
| 2003 | 62,352,373 | 22,821,420 | 37,318,209 | 112,412,977 | 33,066,539 | 12,888,729 | 280,860,247 | 284,805,441 |
| 2004 | 64,197,878 | 24,776,517 | 37,709,754 | 114,966,399 | 36,599,022 | 14,064,498 | 292,314,068 | 296,259,262 |
| 2005 | 66,474,211 | 25,241,176 | 38,438,828 | 116,865,354 | 34,382,926 | 13,945,254 | 295,347,749 | 299,292,943 |
| 2006 | 66,236,922 | 25,669,960 | 37,359,209 | 114,899,678 | 30,163,359 | 14,182,677 | 288,511,805 | 299,292,943 |
| 2007 | 64,902,306 | 25,176,548 | 41,028,059 | 107,083,729 | 33,764,052 | 14,136,742 | 286,091,436 | 299,292,943 |
| 2008 | 64,821,981 | 25,979,096 | 42,026,812 | 104,136,845 | 39,030,151 | 13,981,506 | 289,976,391 | 303,177,898 |
| 2009 | 66,094,261 | 25,451,425 | 41,859,906 | 100,058,506 | 43,830,763 | 15,264,572 | 292,559,433 | 305,760,940 |
| 2010 | 66,192,190 | 25,159,956 | 42,081,642 | 109,545,925 | 37,344,153 | 14,680,980 | 295,004,846 | 308,206,353 |
| 2011 | 68,095,579 | 26,670,601 | 43,128,522 | 113,323,337 | 35,423,056 | 15,475,193 | 302,116,288 | 315,317,795 |
| Balance | 1990 | 411,303,018 | 112,484,886 | 520,819,705 | 2,391,869,176 | 481,850,406 | 234,714,204 | 4,153,041,395 | 4,153,041,395 |
| 1991 | 449,555,943 | 114,636,466 | 538,338,923 | 2,632,351,038 | 488,681,358 | 135,503,904 | 4,359,067,632 | 4,359,067,632 |
| 1992 | 472,878,764 | 115,981,981 | 555,204,669 | 2,799,501,028 | 405,022,487 | 124,917,358 | 4,473,506,287 | 4,473,506,287 |
| 1993 | 518,476,337 | 125,178,256 | 594,725,808 | 3,101,602,642 | 223,275,341 | 176,340,177 | 4,739,598,561 | 4,739,598,561 |
| 1994 | 550,462,692 | 130,184,619 | 608,098,483 | 3,184,619,955 | 242,750,431 | 138,754,052 | 4,854,870,232 | 4,854,870,232 |
| 1995 | 597,222,065 | 133,133,765 | 628,331,364 | 3,303,541,359 | 241,937,557 | 142,587,383 | 5,046,753,493 | 5,046,753,493 |
| 1996 | 635,253,941 | 134,451,380 | 649,588,534 | 3,105,334,912 | 309,999,620 | 155,157,839 | 4,989,786,226 | 5,046,753,493 |
| 1997 | 651,329,226 | 135,795,123 | 635,745,394 | 2,948,632,075 | 361,360,418 | 158,976,618 | 4,891,838,854 | 5,046,753,493 |
| 1998 | 685,276,059 | 138,740,719 | 626,057,174 | 2,694,973,856 | 579,278,480 | 155,654,343 | 4,879,980,631 | 5,046,753,493 |
| 1999 | 698,480,901 | 149,171,151 | 620,441,866 | 2,619,971,802 | 583,130,966 | 152,589,920 | 4,823,786,606 | 5,046,753,493 |
| 2000 | 705,268,406 | 150,291,413 | 635,937,017 | 2,755,864,322 | 435,568,590 | 152,418,825 | 4,835,348,573 | 5,058,315,460 |
| 2001 | 744,785,195 | 159,214,726 | 654,076,497 | 2,764,129,950 | 503,665,449 | 167,231,815 | 4,993,103,632 | 5,216,070,519 |
| 2002 | 825,246,376 | 161,828,332 | 650,045,353 | 2,794,361,964 | 507,535,577 | 185,685,022 | 5,124,702,624 | 5,347,669,511 |
| 2003 | 911,642,048 | 173,155,605 | 650,927,530 | 2,695,011,267 | 659,107,561 | 200,331,147 | 5,290,175,158 | 5,513,142,045 |
| 2004 | 1,003,173,589 | 182,647,177 | 673,452,720 | 2,824,009,633 | 737,074,438 | 212,683,544 | 5,633,041,101 | 5,856,007,988 |
| 2005 | 1,036,764,834 | 199,075,905 | 673,843,395 | 2,828,696,527 | 687,906,506 | 215,045,501 | 5,641,332,668 | 5,864,299,555 |
| 2006 | 1,014,487,941 | 192,271,887 | 636,183,252 | 2,717,206,723 | 600,245,906 | 212,607,979 | 5,373,003,688 | 5,864,299,555 |
| 2007 | 960,550,782 | 191,298,556 | 630,295,251 | 2,518,668,276 | 666,436,458 | 196,712,348 | 5,163,961,671 | 5,864,299,555 |
| 2008 | 978,923,355 | 197,781,875 | 648,058,750 | 2,463,868,326 | 770,230,717 | 198,819,995 | 5,257,683,018 | 5,958,020,902 |
| 2009 | 1,007,918,644 | 194,261,881 | 655,093,697 | 2,411,035,066 | 874,303,391 | 210,962,436 | 5,353,575,115 | 6,053,912,999 |
| 2010 | 1,024,061,600 | 188,903,873 | 670,205,917 | 2,642,163,491 | 746,143,661 | 214,080,191 | 5,485,558,733 | 6,185,896,617 |
| 2011 | 1,051,592,150 | 196,522,972 | 684,965,833 | 2,735,411,812 | 705,346,242 | 214,119,039 | 5,587,958,048 | 6,288,295,932 |

Source: Author’s estimates using the methodology presented in the text,

1 – This enterprise trajectory based on annual crops (soybeans and corn) was not significant in 1995. The 2006 Agricultural Census strongly indicated the emergence of annual crops, so the model was calibrated to capture it.

2 – $If (E\_{(t`+1)}^{\pm }- E\_{\left(t`\right)}^{\pm })>0 then E\_{\left(t`+1\right)}^{A}= E\_{\left(t+1`\right)}^{\pm }; else E\_{\left(t`+1\right)}^{A}= E\_{\left(t`\right)}^{A}$