

**Table S2** - Sequency of crops used in 26 experimental yeaars under different agricultural systems and fertilization levels

Treatments	Description
ICL-F1	Tillage with a disk plow started 1991, and in the first three years with grain crops (soybean, maize, rice or sorghum) annual rotation (1991-1993). From the fourth year (1994), no-till system was introduced. After this, a crop-pasture rotation was established (3 crop seasons with pasture and 3 crop seasons with annual crops). This procedure was made for 26 years. In the pasture phase, plot was grazed according to forage availability, to maintain the forage supply of 8-10 kg per 100 kg of animal weight. In November 2015 soybean was sown and harvested in February 2016 and fertilized with 80 kg ha <sup>-1</sup> of P <sub>2</sub> O <sub>5</sub> , and 80 kg ha <sup>-1</sup> of K <sub>2</sub> O. In March 2016 (off-season) <i>Panicum maximum</i> (cv. BRS Tamani) was planted in succession, <b>but did not germinate</b> . In November 2016, soybean was planted again and harvested in February and fertilized with 80 kg ha <sup>-1</sup> of P <sub>2</sub> O <sub>5</sub> , and 80 kg ha <sup>-1</sup> of K <sub>2</sub> O. In March 2017 (off-season) <i>Sorghum bicolor</i> was intercropped with <i>Panicum maximum</i> . N <sub>2</sub> O fluxes were evaluated during two agricultural years in the 2015/2016 and 2016/2017 and off-seasons, totaling 78 days of N <sub>2</sub> O sampling.
ICL-F2	Tillage with a disk plow started 1991, and in the first three years with grain crops (soybean, maize, rice or sorghum) annual rotation (1991-1993). From the fourth year (1994), no-till system was introduced. After this, a crop-pasture rotation was established (3 crop seasons with pasture and 3 crop seasons with annual crops). This procedure was made for 26 years. In the pasture phase, plot was grazed with cattle. In the pasture phase, plot was grazed with to maintain the forage supply of 8-10 kg per 100 kg of animal weight. In November 2015 soybean was sown and harvested in February 2016 and fertilized with 80 kg ha <sup>-1</sup> of P <sub>2</sub> O <sub>5</sub> , and 80 kg ha <sup>-1</sup> of K <sub>2</sub> O. In March 2016 (off-season) <i>Panicum maximum</i> (cv. BRS Tamani) was planted in succession, <b>but did not germinate</b> . In November 2016, soybean was planted again and harvested in February and fertilized with 80 kg ha <sup>-1</sup> of P <sub>2</sub> O <sub>5</sub> , and 80 kg ha <sup>-1</sup> of K <sub>2</sub> O. In March 2017 (off-season). <i>Sorghum bicolor</i> was intercropped with <i>Panicum maximum</i> . N <sub>2</sub> O fluxes were evaluated during two agricultural years in the 2015/2016 and 2016/2017 and off-seasons, totaling 78 days of N <sub>2</sub> O sampling.
CC-F1	Tillage with a disk plow started 1991, and in the first three years with grain crops (soybean, maize, rice or sorghum) annual rotation (1991-1993). From the fourth year (1994), no-till system was introduced in a continuous crop system. In this system the maize, soybean and sorghum crops, in absence of animal grazing. This procedure was made for 26 years. In November 2015 soybean was planted and harvested in February 2016 and fertilized with 80 kg ha <sup>-1</sup> of P <sub>2</sub> O <sub>5</sub> , and 80 kg ha <sup>-1</sup> of K <sub>2</sub> O. In March 2016 (off-season) <i>Panicum maximum</i> (cv. BRS Tamani) was planted in succession, <b>but did not germinate</b> . In November 2016, soybean was planted and harvested in February and fertilized with 80 kg ha <sup>-1</sup> of P <sub>2</sub> O <sub>5</sub> , and 80 kg ha <sup>-1</sup> of K <sub>2</sub> O. In March 2017

(off-season), *Sorghum bicolor* was intercropped with species mix (*Eleusine coracana*, *Brachiaria brizantha* Cv. Paiaguá, *Cajanus cajan* IAPAR 43, *Crotalaria spectabilis* and *Raphanus sativus*). N<sub>2</sub>O fluxes were evaluated during two agricultural years in the 2015/2016 and 2016/2017 and off-seasons, totaling 78 days of N<sub>2</sub>O sampling.

**CC-F2** Tillage with a disk plow started 1991, and in the first three years with grain crops (soybean, maize, rice or sorghum) annual rotation (1991-1993). From the fourth year (1994), no-till system was introduced in a continuous crop system. In this system, maize, soybean and sorghum crops, in absence of animal grazing. This procedure was made for 26 years. In November 2015 soybean was planted and harvested in February 2016 and fertilized with 80 kg ha<sup>-1</sup> of P<sub>2</sub>O<sub>5</sub>, and 80 kg ha<sup>-1</sup> of K<sub>2</sub>O. In March 2016 (off-season) *Panicum maximum* (cv. BRS Tamani) was planted in succession, but did not germinate. In November 2016, soybean was planted and fertilized with 80 kg ha<sup>-1</sup> of P<sub>2</sub>O<sub>5</sub>, and 80 kg ha<sup>-1</sup> of K<sub>2</sub>O, and harvested in February. In March 2017 (off-season), *Sorghum bicolor* was intercropped with species mix (*Eleusine coracana*, *Brachiaria brizantha* Cv. Paiaguá, *Cajanus cajan* IAPAR 43, *Crotalaria spectabilis* and *Raphanus sativus*). N<sub>2</sub>O fluxes were evaluated during two agricultural years in the 2015/2016 and 2016/2017 and off-seasons, totaling 78 days of N<sub>2</sub>O sampling.

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