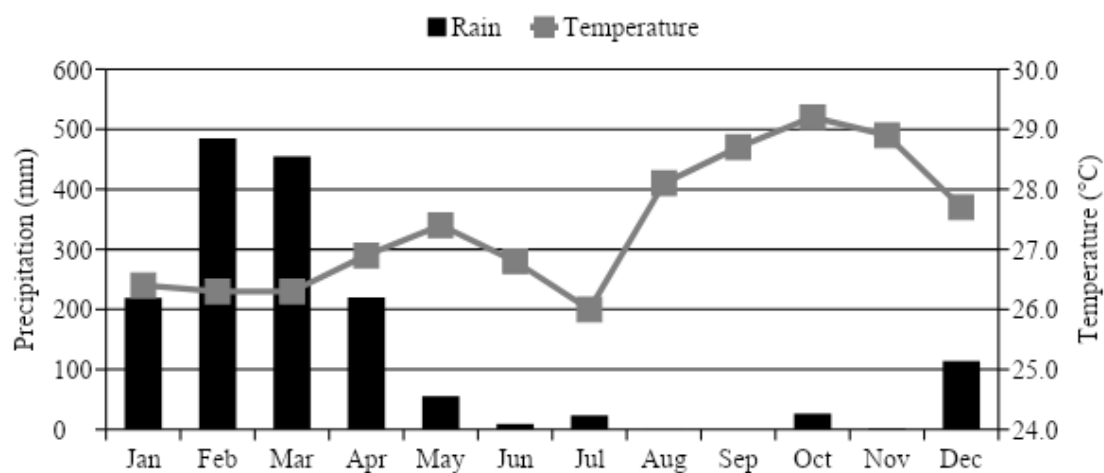


## Integrated production systems in a Plinthosol: greenhouse gas emissions and soil quality

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**Supplementary Table 1.** Description of the integrated systems evaluated in Pindaré-Mirim, Maranhão, Brazil.

Environments	Historic
System 1 Integrated system Maize / Eucalyptus (S1)	Area of 3.5 ha, in the second crop year (2016 and 2017), where maize was grown (hybrid KWS 9304 - for grain maize; and AG1051 - for green maize), under the no-tillage system, spaced at 0.6 m x 0.3 m with a stand of 66,600 plants ha <sup>-1</sup> , in consortium with Marandú grass ( <i>Urochloa brizantha</i> cv. Marandú). The arboreal component is represented by Eucalyptus ( <i>Eucalyptus grandis</i> ) (3 m x 2 m in double rows and 28 m between rows). This system was deployed in February 2016. Before implantation, the area was cultivated with <i>Urochloa brizantha</i> cv. Marandú for about 14 years. There were no grazing animals during the experimental period. The yield of maize (grain) in 2016/2017 harvest was 8,580 kg ha <sup>-1</sup> .
System 2 Integrated system Maize / Grass (S2)	Area of 3.0 ha where maize was grown (Dow Herculex), spaced 0.5 m x 0.25 m, with a stand of 83,000 plants ha <sup>-1</sup> in a consortium with Massai grass ( <i>Megathyrsus maximus</i> cv. Massai). The integrated system was deployed in January 2017. Before this, the area was cultivated for about 14 years with <i>Urochloa brizantha</i> cv. Marandú. During the experiment, there was no entry of animals. The maize yield of this system was 9,780 kg ha <sup>-1</sup> in 2016/2017.
System 3 Degraded pasture (S3)	Area of 3.0 ha cultivated with <i>Urochloa brizantha</i> cv. Marandú, with more than 14 years of implementation, used for grazing, maintaining a stocking rate of 0.5 animal unit ha <sup>-1</sup> . Presence of invasive plants with a great predominance of "goat beard". This use represents the previous stage of the S1 and S2 areas before deploying these integrated systems. Therefore, it is taken as a reference for their comparisons.



**Fig 1.** Rain precipitation volume and average air temperature data during 2017. Pindaré-Mirim, Maranhão, Brazil..

**Supplementary Table 2.** Characterization of soil fertility under different management systems at Technological Reference Unit of CLFI in Pindaré-Mirim, Maranhão, Brazil,, layer 0-10cm.

Systems	pH	P	K	Na	Ca	Mg	Al	H + Al	SB	CEC
CLFI	4.4	2	0.53	-	2.2	3.2	-	2.9	5.93	8.83
CLI	4.6	2	0.44	0.74	3.2	1.3	-	2,3	5.68	7.98
DEG	4.4	2	0.53	-	2.2	3.2	-	2.9	5.93	8.83

CLFI: Eucalyptus, Maize, and Grass Integration System; CLI: Maize and Grass Integration System; DEG: Degraded pasture (reference system). Adapted from Reis et al. (2018).



**Fig 2.** CLFI Technological Reference Unit (URT). Image of different integrated production systems and degraded pasture, located in the municipality of Pindaré-Mirim, Maranhão, Brazil,. Source: Author of the research. Google Earth, image for April 20, 2020.

**Supplementary Table 3.** Characterization of soil particle-size under different management systems in the Technological Reference Unit of CLFI in Pindaré-Mirim, Maranhão, Brazil, in the layer space (0-10 cm) in %

Systems	Particle-size %		
	Sand	Clay	Silt
CLFI	50.8	15.4	33.8
CLI	53.0	17.0	30.0
DEG	46.8	16.5	36.7

CLFI: Eucalyptus, Maize, and Grass Integration System; CLI: Maize and Grass Integration System; DEG: Degraded pasture (reference system). Adapted from Reis (2018).