

Amaral, Diego Ribeiro do<sup>1,2</sup>; Novaes, Renan M.L.<sup>1</sup>; Pighinelli, Anna Letícia M.T.<sup>1</sup>; Garofalo, Danilo F.T.<sup>1</sup>; Dutra, Emmanuel D.<sup>2</sup>; Maciel, Vinícius G.<sup>1</sup>; Folegatti-Matsuura, Marília I.S.<sup>1</sup>

<sup>1</sup>Embrapa Meio Ambiente, Jaguariúna-SP, Brazil.

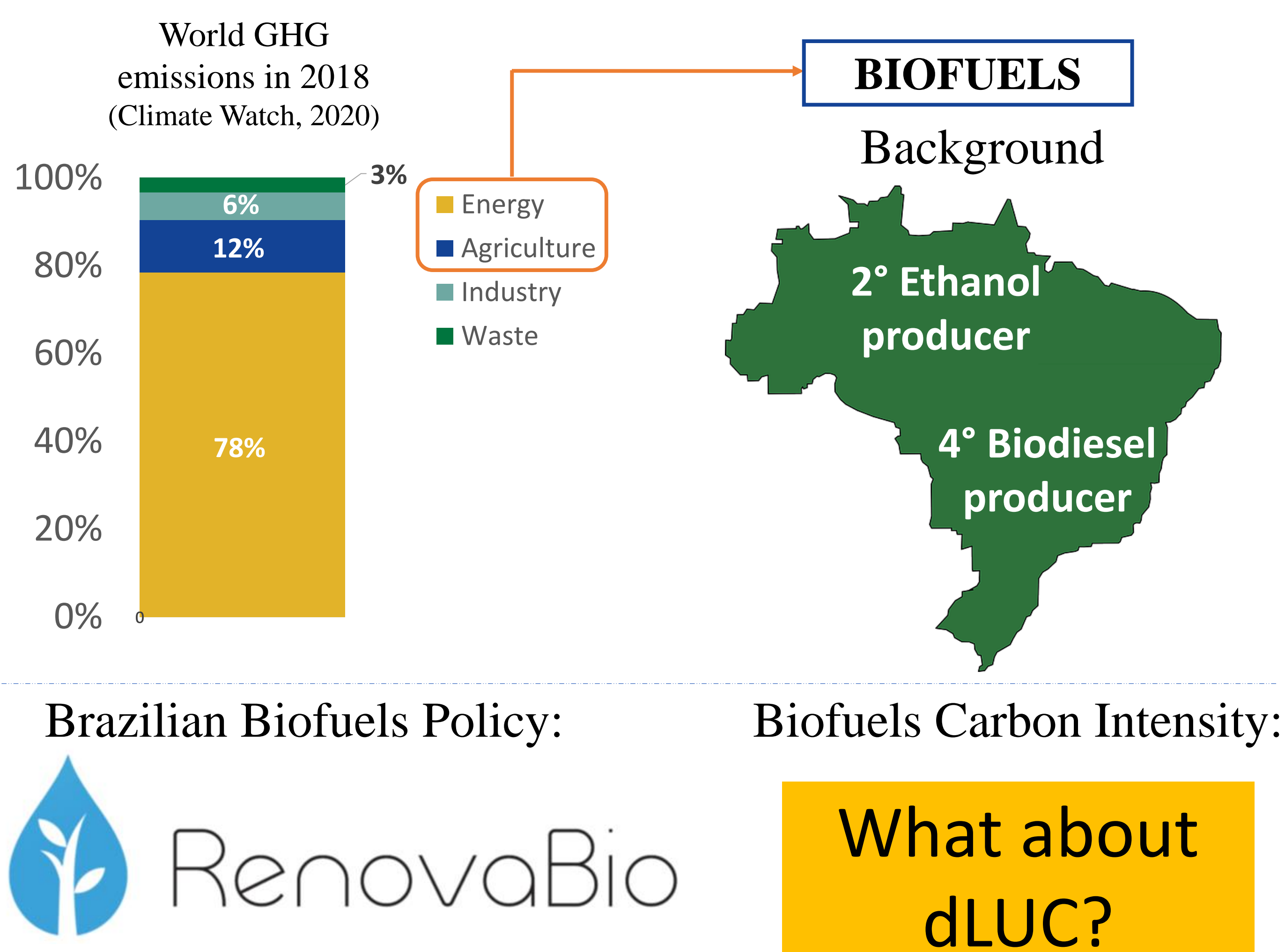
<sup>2</sup>Universidade Federal de Pernambuco, Grupo de Pesquisa em Energia da Biomassa, Recife-PE, Brazil.

E-mails: [diegordamaral@gmail.com](mailto:diegordamaral@gmail.com); [renan.novaes@embrapa.br](mailto:renan.novaes@embrapa.br); [marilia.folegatti@embrapa.br](mailto:marilia.folegatti@embrapa.br)

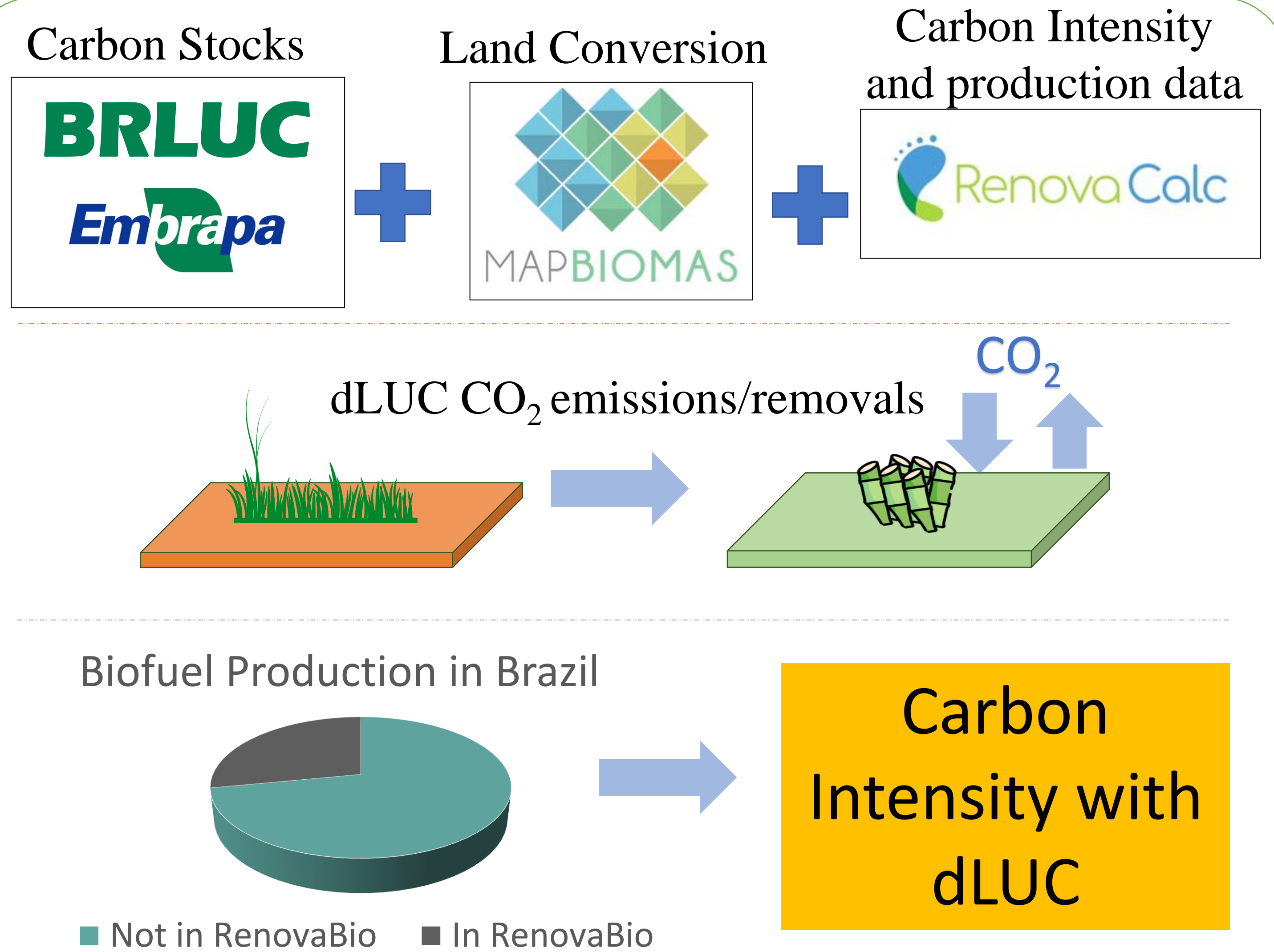
## Abstract

Brazil's biofuel policy (**RenovaBio**) aims to decarbonize the country's fuel mix. In 2018, **direct land use change (dLUC)** accounted for 41% of Brazilian GHG emissions. RenovaBio restricts suppression of native vegetation, but other dLUC are not accounted for. This work estimates the CO<sub>2</sub> removals or emissions from these unaccounted dLUC between 2018 to 2020. **It was estimated an average removal of 0.15 gCO<sub>2</sub>.MJ<sup>-1</sup> from sugarcane ethanol and an emission of 1.49 gCO<sub>2</sub>.MJ<sup>-1</sup> from soybean biodiesel's dLUC.** Overall, **average mitigation effect decreased by 0.04%**, indicating that quantifying dLUC had little influence in this period. Further studies are necessary to explore longer periods and different assumptions.

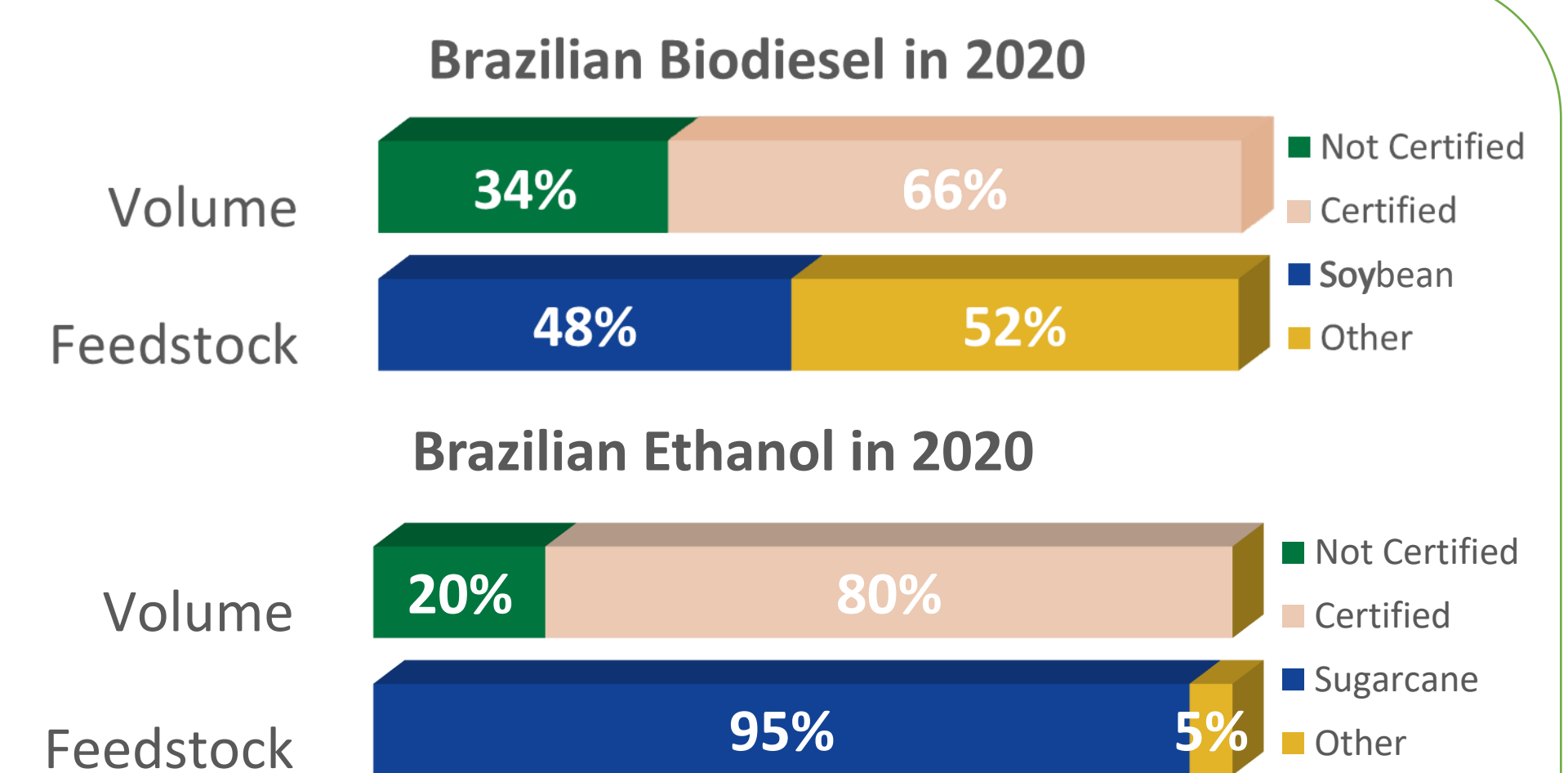
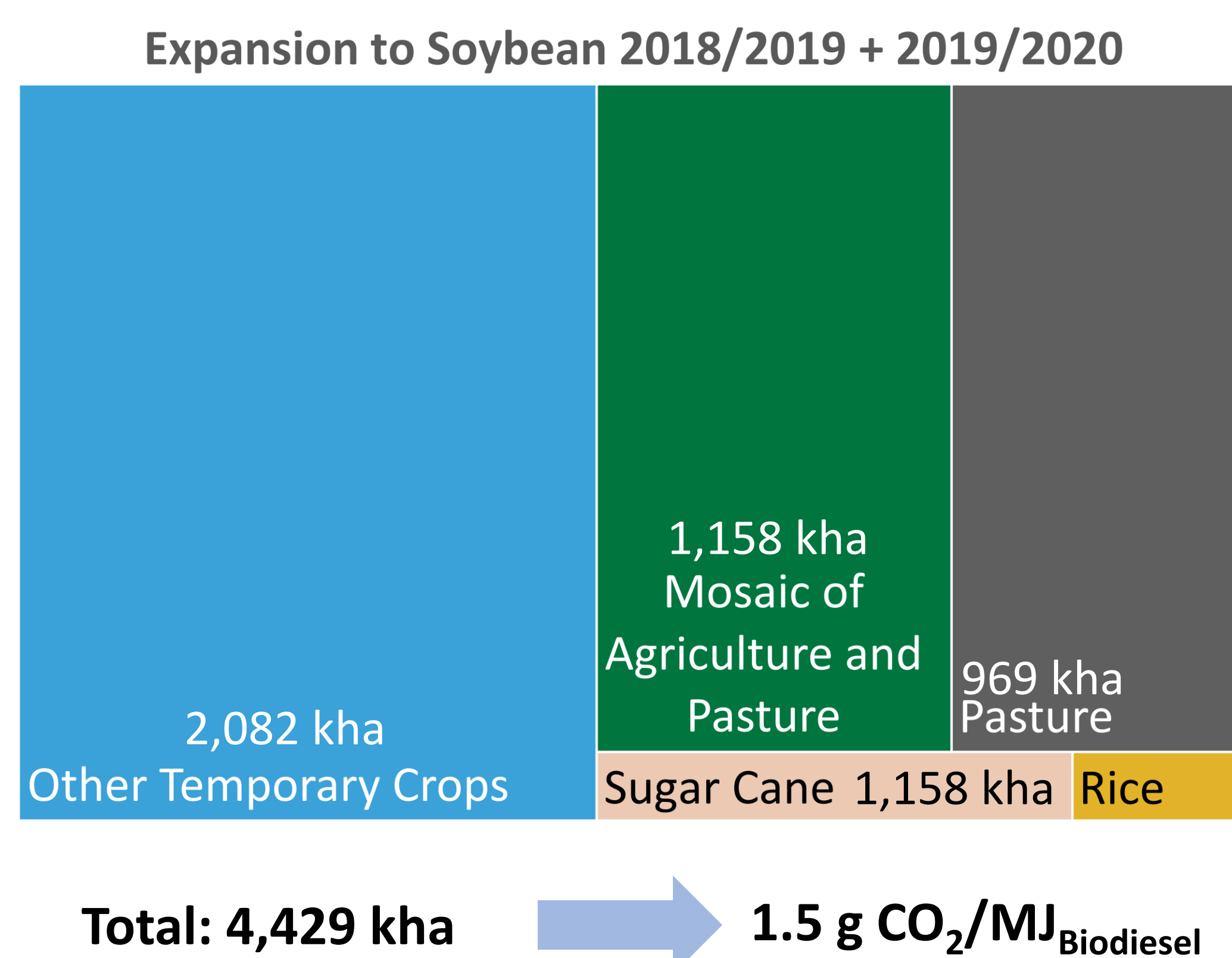
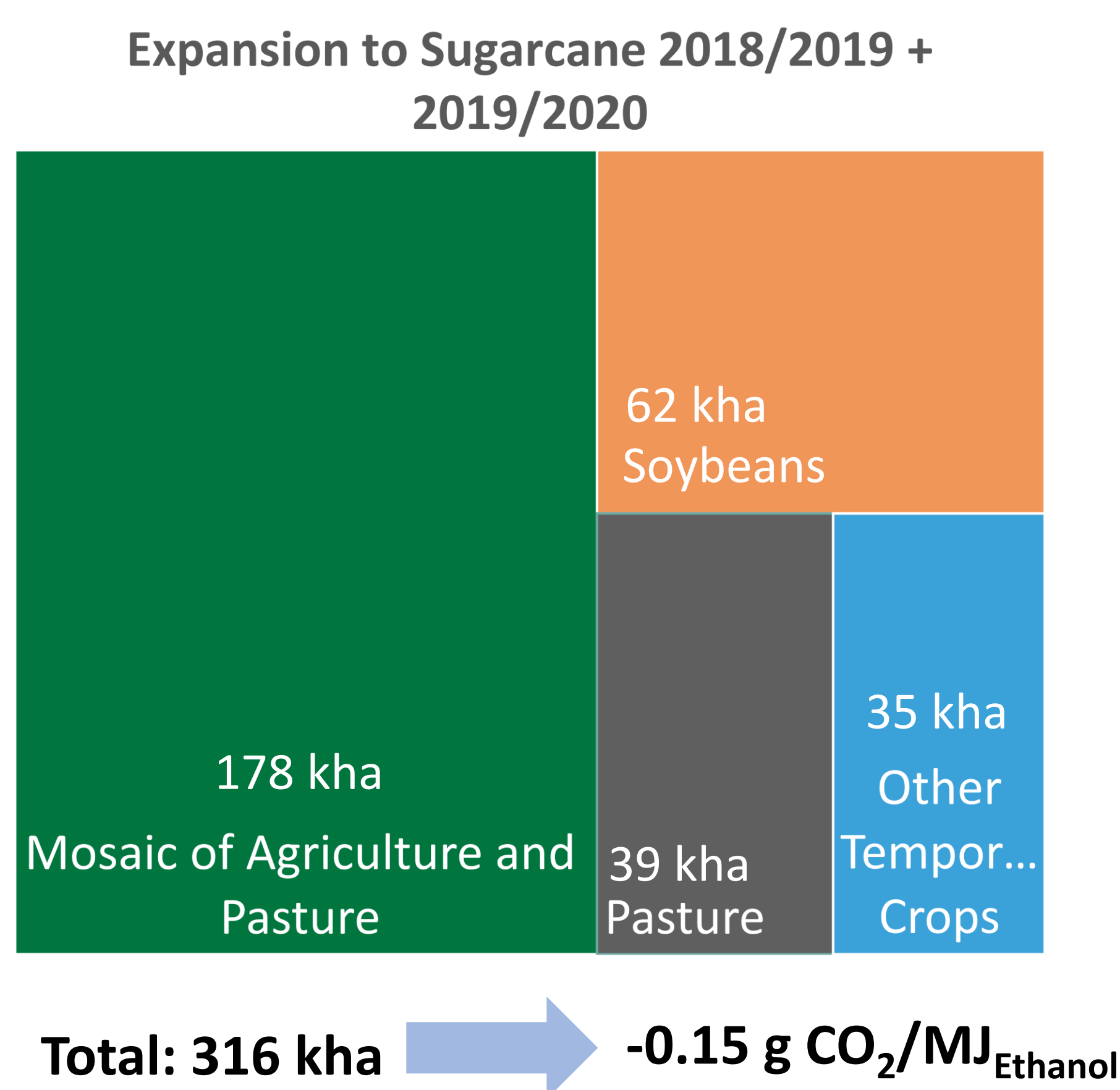
## Introduction



## Methodology



## Results



$$\frac{\text{Biodiesel}_{\text{soybean}} \text{ dLUC}}{\text{Certified Biodiesel}_{\text{soybean}}} + \frac{\text{Ethanol}_{\text{sugarcane}} \text{ dLUC}}{\text{Certified Ethanol}_{\text{sugarcane}}} = 0.03 \frac{\text{gCO}_2}{\text{MJ}_{\text{biofuel}}}$$

**Average mitigation = 60 gCO<sub>2</sub>eq/MJ<sub>biofuel</sub>** → **-0,04%**

**Subtracting dLUC = 59.97 gCO<sub>2</sub>eq/MJ<sub>biofuel</sub>**

## Conclusions

Excluding conversions from native vegetation, which are not allowed in RenovaBio, considering Brazil's expansion patterns for sugarcane and soybean crops, as well as their average yields and contribution to ethanol and biodiesel certification under RenovaBio, between 2018 and 2020 the **estimated CO<sub>2</sub> emissions from dLUC did not show considerable effects on the mitigation potential** of those biofuels or the policy as a whole. These findings suggest that **RenovaBio's eligibility criteria, particularly the exclusion of areas converted from native vegetation, may be sufficient to prevent high emissions from dLUC.** It is important to conduct further analysis to confirm these preliminary conclusions.