

Lucas Rios do Amaral

CNPq Research Productivity Fellow, Level C

ORCID: <http://orcid.org/0000-0001-8071-4449>Lattes CV: <http://lattes.cnpq.br/0694700754100102>Scopus ID: <https://www.scopus.com/authid/detail.uri?authorId=24075557300>Web of Science: <https://www.webofscience.com/wos/author/record/K-7688-2015>Google Scholar: https://scholar.google.com/citations?hl=pt-BR&user=SjbbSY4AAAAJ&sortby=pubdate&view_op=list_works**1. EDUCATION**

<i>Degree or Activity</i>	<i>Period</i>	<i>Institution</i>
B.Sc. in Agronomic Engineering	2004 – 2008	Federal University of São Carlos (CCA/UFSCar)
M.Sc. in Crop Science	2009 – 2011 (21 months)	Luiz de Queiroz College of Agriculture, University of São Paulo (ESALQ/USP)
Ph.D. in Crop Science	2011 – 2014 (38 months)	Luiz de Queiroz College of Agriculture, University of São Paulo (ESALQ/USP)
Sandwich Ph.D.	2013 (4 months)	University of Nebraska - Lincoln, NE, EUA (UNL)
Postdoc	2015 (5 month)	Brazilian Bioethanol Science and Technology Laboratory (CTBE/CNPEN)
Habilitation (Livres-Docência)	Obtained in April 2023	School of Agricultural Engineering, University of Campinas (FEAGRI/UNICAMP)

2. PROFESSIONAL HISTORY (*List up to 3 main professional positions you have held.*)

- 2.1. **Faculty member at the University of Campinas**, School of Agricultural Engineering (FEAGRI/UNICAMP). Hired as Assistant Professor (MS-3.1) in June 2015; merit promotion (MS-3.2) in May 2019; promoted to Associate Professor (MS-5.1) in April 2023.
- 2.2. **Scientific Director of the Brazilian Association of Precision Agriculture** (AsBraAP), since June 2024.
- 2.3. **International Society of Precision Agriculture board (ISPA) - Latin America and the Caribbean Regional Representative**, since July 2026

3. CONTRIBUTIONS TO SCIENCE (*List up to 5 of the most relevant research products and justify*)

- 3.1. BEJARANO, L.D.; OLIVEIRA, A.L.G.; POZZUTO, J.V.; SÁNCHEZ, D.C.; AMARAL, L.R. Performance of interpolation methods in digital soil mapping: the influence of data characteristics. **Precision Agriculture**, v. 27, jan 2026. (Scopus Citations: 0 - *Recently published*)

Justification: *This work resulted from a master's dissertation that I supervised with a FAPESP scholarship and constitutes an important component of my FAPESP PI grant. I highlight it as one of the most relevant outputs of my career because it addresses a practical problem faced by precision*

agriculture practitioners: selecting the interpolation method for soil maps. Such a choice is typically arbitrary; therefore, we developed a framework based on the characteristics of the data under analysis. In addition, this research demonstrated that the method commonly regarded as the standard, i.e., kriging, is not the most robust option for this type of application, neither in its ordinary form nor in its multivariate variants. I expect this work to become a reference for both the academic community and practitioners exploring different types of data. Digital soil mapping will be a focal point of the research proposed in this project, and I point out that the first author of this paper will conduct her doctoral research within the scope of this project.

- 3.2. MELO, D.D.; CUNHA, I.A.; AMARAL, L.R. Precision Zones: an open-source QGIS plugin for management-zone segmentation in precision agriculture. **AgriEngineering**, v. 7, dez 2025. (Scopus Citations: 0 - Recently published)

Justification: I consider this work to be one of the most relevant in my career; in fact, its main contribution lies in the QGIS tool it presents. We developed a plugin for QGIS, an open-source GIS software, that enables the generation of management zones using methods supported in the literature and includes practical functionalities. For years, we developed routines in R to perform these analyses, but we observed a significant programming language barrier. Therefore, we expect this plugin to enhance the adoption of management zones in agriculture. Moreover, this tool is directly linked to the expected outcomes of my FAPESP PI grant and involves the direct contribution of one of my graduate students supported by a FAPESP scholarship. In the present research, the delineation of management zones will be a key aspect to be investigated, particularly given the limited literature addressing this topic for perennial crops.

- 3.3. PUSCH, M.; SAMUEL-ROSA, A.; MAGALHAES, P.S.G.; AMARAL, L.R. Covariates in sample planning optimization for digital soil fertility mapping in agricultural areas. **Geoderma**, v. 429, 2023. (Scopus citation: 15)

Justification: This paper is based on a Ph.D. thesis I supervised, which addressed issues related to soil sampling and map generation using multivariate kriging methods (Kriging with External Drift and Regression Kriging). In this study, we explored sampling optimization methods and found that using environmental variables obtained through sensing techniques, along with management-related variables, plays an important role in improving interpolation results. However, we also observed that directing all sampling points based solely on these variables may increase prediction errors when the relationships between the variables of interest and the selected covariates are weaker than expected. Therefore, we proposed using regular grids, with a fraction of sampling points allocated via optimization approaches. This strategy has been applied in both research and practical user applications with positive results. In the present study, a key stage will involve digital soil mapping to delineate management zones and guide the implementation of strip-based experiments, which is directly aligned with the expertise demonstrated in this work.

- 3.4. SIMÕES, I.O.P.S.; AMARAL, L.R. UAV-based multispectral data for sugarcane resistance phenotyping of orange and brown rust. **Smart Agricultural Technology**, v. 4, p. 100144, 2023. (Scopus citation: 17)

Justification: This paper is based on a Ph.D. thesis I supervised, conducted in partnership with the Interuniversity Network for the Development of the Sugar-Energy Sector (RIDESA). We focused on a specific stage in sugarcane breeding to determine the susceptibility of genotypes to foliar diseases, particularly rust. This demonstrates my experience in using drone imagery to extract relevant attributes, which will be essential for the on-farm experiments proposed in this research.

- 3.5. PEREIRA, F.R. S.; LIMA, J.P.; FREITAS, R.G.; DOS REIS, A.A.; AMARAL, L.R.; FIGUEIREDO, G.K.D.A.; LAMPARELLI, R.A.C.; MAGALHÃES, P.S.G. Nitrogen variability assessment of pasture fields under an integrated crop-livestock system using UAV, PlanetScope, and Sentinel-2 data. **Computers and Electronics in Agriculture**, v. 193, 106645, 2022. (Scopus citation: 42)

Justification: This is one of the most-cited papers of my academic career, published in a high-impact journal and focused on integrating sensing technologies for nitrogen assessment. As the present research will also involve this type of technology and experiments with fertilizer rates, this study illustrates one of the approaches we intend to follow.

4. **RESEARCH FUNDING** (Most relevant funding opportunities - maximum of 5 -, current and/or completed, as Principal Investigator or Responsible Investigator)

- 4.1. FAPESP – Special Programs / PNGP – New Generation of Researchers Program / PI – Research Grant – Initial Project. Project title: **Soil spatial variability mapping and optimized sampling supported by sensing techniques: bases for a more efficient and sustainable precision agriculture** (process no. 2022/03160-8). Duration: 02/01/2023 to 01/31/2028. Role: Responsible Investigator.
- 4.2. CNPq/MCTI/FNDCT Call No. 22/2024 – Knowledge Brazil Program – Support for Network Projects with Brazilian Researchers Abroad. Project title: **Soil sampling and digital soil mapping for efficient fertilizer use: personalized sampling planning through remote sensing and artificial intelligence** (process no. 444663/2024-0). Duration: 09/12/2024 to 08/12/2026. Role: Responsible Investigator.
- 4.3. FAPESP CPE/CPA – Engineering Research Centers / Applied Research Centers. Project title: **Plant Molecular Breeding Center (CeM²P)** (process no. 2022/04006-2), with activities carried out within the Joint Research Activity (JRA) on High-Throughput Phenotyping for Sugarcane and Tropical Forage Crops. Duration: 01/02/2025 to 31/01/2035. Role: Collaborating Researcher, supervising one M.Sc. student and one Ph.D. student within CeM²P.

- 4.4. Innovate UK Climate-Smart Agriculture Partnership: UK-Brazil-Africa (2024). Project title: **SmartPest-Ghana: Exploring LLM-Driven Mobile Solutions for Climate-Smart Pest Management in Maize Farming** (<https://iuk-business-connect.org.uk/smartpest-ghana/>). Duration: 05/08/2025 to 05/02/2026. Role: Brazilian Researcher.
- 4.5. FAPESP Regular Research Grant – Project title: **Sugarcane proximal sensing: agronomic variables and soil spectroscopy** (process n° 2015/21616-5) - Duration: 01/06/2016 to 31/05/2018. Role: Responsible Investigator.

5. QUANTITATIVE INDICATORS

- 5.1. Published books: 01
- 5.2. Papers in peer-reviewed journals with selective editorial policies: 61
- 5.3. Book chapters: 05
- 5.4. Master's dissertations
- 5.4.1. Completed supervisions: 10
- 5.4.2. Ongoing: 02
- 5.5. Ph.D. theses
- 5.5.1. Completed supervisions: 06
- 5.5.2. Ongoing: 04
- 5.6. Total citations received:
- 5.6.1. Web of Science: 254 citations in 15 documents, with H-index of 10.
- 5.6.2. Scopus: 950 citations in 64 documents, with H-index of 18.
- 5.6.3. Google Scholar: 1962 citations, with H-index of 25.
- 5.7. Products developed and released to the market: 03 (QGIS plugins)

6. ADDITIONAL INFORMATION

6a) Other information to document your experience and competence in the field of knowledge:

i) I am author of the book “Precision Agriculture” (Molin, Amaral, and Colaço, 2015, Oficina de Textos), which is the main reference material on the subject in Brazil. ii) I have served as Editor of the Digital Agriculture section of the journal Engenharia Agrícola (EAgri) since 2019. I also regularly act as a reviewer for several national and international scientific journals. iii) I periodically offer technology transfer and distance extension courses related to Geostatistics and Precision Agriculture through the UNICAMP Extension School (Extcamp). iv) I am the coordinator of the Interdisciplinary Group on Precision Agriculture Technology (GITAP – dgp.cnpq.br/dgp/espelhogrupo/5792299103391699), which I founded in October 2015. v) We actively disseminate our research and topics related to precision agriculture on social media (@lucasamaral.unicamp and @gitap.feagri).

6b) **International engagement:** i) Since August 2024, I have served as the Internationalization Representative of FEAGRI. ii) Throughout 2024, I participated in the Executive International Academic

Leadership Program, a partnership between UNICAMP and Delft University of Technology (The Netherlands). iii) In the last academic semester (1st semester of 2026), I organized the “International Lecture Series on Precision & Digital Agriculture”, a remote event in which I host an international collaborator each week to present their university and research lines. iv) I also highlight the facilitation of student exchanges through these partnerships, including two undergraduate students (2024 and 2025) and two Ph.D. students (2026) to the University of Georgia, and one undergraduate student to Kansas State University. v) This year (July 2026), I was elected as the ISPA Board Latin America and the Caribbean Regional Representative.

6c) Awards, distinctions, and honors: i) Pierre C. Robert Precision Agriculture Young Scientist Award recipient granted by the International Society of Precision Agriculture (2026).