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Experimental dataset of sugarcane-cover crop intercropping trials to control weeds in Reunion Island

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ABSTRACT

Agroecological studies on sugarcane intercropping commonly generate complex datasets. A generic database (AEGIS – Agro-Ecological Global Information System) has been developed to facilitate the use of these datasets. The data described in this paper includes data from 8 experiments carried out on Reunion Island from 2012 to 2021 under three soil and climatic conditions to assess the capacity of cover crops in the sugarcane inter-row to control weed growth. Each experiment consisted of the comparison of three treatments in the inter-row: i) sugarcane with chemical weeding, ii) sugarcane with a cover crop sowed in the inter-row, and iii) sugarcane with spontaneous weed flora in the inter-row. The datasets contain data for sugarcane and cover crop observations (e.g., yield), weed flora, including 104 weed species (e.g., ground cover), crop management (including manual and chemical weedings), soil analyses, and

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daily weather. This dataset provides an adequate experimental dataset to calibrate or validate crop model simulations under intercropping.

Specifications Table

Subject	Agronomy and Crop Science, Data Science
Specific subject area	Cropping systems of sugarcane in association with cover crops.
Type of data	Table
How the data were acquired	Data were obtained from a network of height randomized-block agronomical experiments with three treatments. The data included crop management information (harvest dates, weeding interventions, fertilization rate), field measurements (biomass, plant ground cover), weather measurements from meteorological stations, and spontaneous flora description. Plant biomass and ground cover were measured in sub-plots, excluding borders.
Data format	Raw Analyzed
Description of data collection	Experimental dataset from sugarcane experiments with three inter-row weed management: i) chemical weed control in the inter-row, ii) cover crop sown in the inter-row, iii) no weed control in the inter-row.
Data source location	· Institution: eRcane and CIRAD · City/Town/Region: La Réunion · Country: France · Latitude and longitude: −21.115141; 55.536384
Data accessibility	Repository name: CIRAD dataverse, APEEDAIS Data identification number: https://doi.org/10.18167/DVN1/SLGV2M https://doi.org/10.18167/DVN1/WTFBBY https://doi.org/10.18167/DVN1/1S0YSQ https://doi.org/10.18167/DVN1/YUKJGB https://doi.org/10.18167/DVN1/CLOJLC https://doi.org/10.18167/DVN1/6XYBVS https://doi.org/10.18167/DVN1/B4EZZY https://doi.org/10.18167/DVN1/UFMLLM https://doi.org/10.18167/DVN1/L9ONHW https://doi.org/10.18167/DVN1/1JCZTI https://doi.org/10.18167/DVN1/2T3RII https://doi.org/10.18167/DVN1/CXEKFC https://doi.org/10.18167/DVN1/MBWTAX https://doi.org/10.18167/DVN1/JUMMVK https://doi.org/10.18167/DVN1/SVXEQ6 https://doi.org/10.18167/DVN1/EMLFCX https://doi.org/10.18167/DVN1/IRCSUR https://doi.org/10.18167/DVN1/XR9BGQ https://doi.org/10.18167/DVN1/0LKVJU https://doi.org/10.18167/DVN1/YFNLWM https://doi.org/10.18167/DVN1/PT4B04 https://doi.org/10.18167/DVN1/K9ISTX https://doi.org/10.18167/DVN1/NWYEN6 https://doi.org/10.18167/DVN1/I7JL0K https://doi.org/10.18167/DVN1/I6PCSS https://doi.org/10.18167/DVN1/SIN3SS https://doi.org/10.18167/DVN1/4O7V30 Direct URL to data: https://dataverse.cirad.fr/dataverse/APEEDAIS

Value of the Data

- These datasets contribute to the available resources on specialized agricultural domains and, more specifically, the cover crop domain.
- Agronomists can use these datasets to assess intercropping performance in meta-analyses.
- These datasets are valuable for calibrating and validating sugarcane crop models.

1. Objective

Weeds are the main bioaggressors of sugarcane on Reunion Island. In tropical conditions, weed control is a significant challenge for sugarcane growth. The objective of the experimental network was to develop innovative intercropping management in sugarcane cropping systems to reduce the use of herbicides. To this end, the experiments aimed to evaluate sugarcane and cover crop intercropping in terms of i) weed suppression, ii) sugarcane yield (including richness), iii) herbicide frequency application index, and iv) the number of additional mechanical or manual weeding.

2. Data Description

The experimental data were separated per individual dataset, including data for one experiment during one sugarcane crop cycle (hereafter defined as a trial, [1–27]). Eight experiments were included with different duration (Table 1) and different numbers of cover crop species compared in the sugarcane inter-row.

Each dataset is organized into six different files in the AEGIS format (Agro-Ecological Global Information System, [28]):

- Accession: It contains the taxonomic description of the different plant species with a unique identifier, the EPPO code.
- Design: This is the description of the experimental design and the different levels of observation (also called experimental unit "exp_unit" including five levels. (Fig. 1): trial, block, plot, subplot (row or interrow), and plants (sugarcane, cover crop, weeds, weeding = weeds + cover crop and weed species).
- Variables: This file describes the observed variables sorted by classes (environmental variable, crop management…) and subclasses (plant, soil, climate…) (Table 2).
- Observations: This file contains the values and dates of the variables observed on a given experimental unit.
- ITK: This is the description of the cropping practices carried out during the growing season on all the plots of the devices
- Weather: It contains daily weather data.

Table 1
List of experiments in the datasets, including the number (Nb) of cover crop (CC) tested.

Experiment	Latitude	Longitude	years	Nb of CC species
P12	−20.903	55.532	2018–2020	1
P41	−20.903	55.528	2015–2021	9
P25 Montagne	−20.902	55.531	2018–2020	2
P25 LEG	−20.902	55.531	2012–2016	5
P25 ITK	−20.902	55.531	2013–2015	3
Canecoh OF	−21.047	55.682	2018–2020	2
Ecocanne AC	−21.067	55.280	2015	2
Ecocanne OB	−21.066	55.285	2014	2

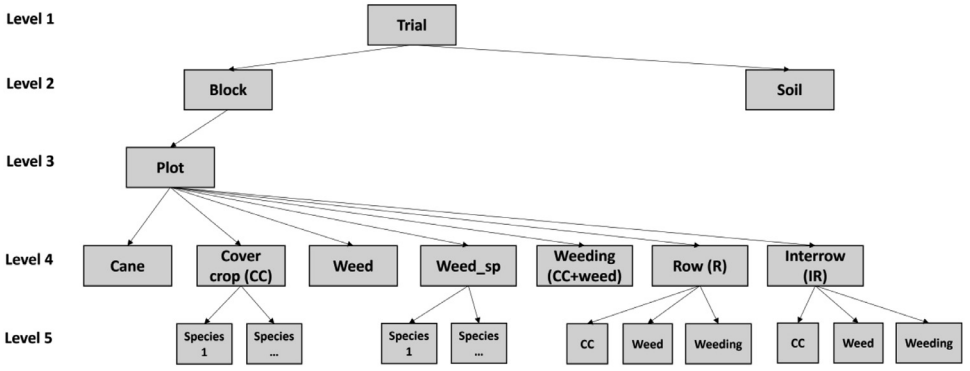

Fig. 1. AEGIS experimental units structure and dependency within the Design file in each dataset.

Table 2
Available variables in the datasets.

Class	Subclass	Variables	File
Environmental variable	Climate	Daily temperature, precipitation, global radiation, and potential evapotranspiration	Weather tab
Environmental variable	Soil	Chemical characteristics (pH, C, N, P, K, Ca, Mg…) and soil type at the beginning of the trials	Observations tab
Experimental variable	Agronomic traits	Sugarcane yield, plant ground cover, number of manual weedings, herbicide frequency application index	Observations tab
Experimental variable	Biomass quality traits	Sugar richness in sugarcane	Observations tab
Crop management	Crop cycle	Sugarcane crop ratooning number	Observations tab
Crop management	Harvesting	Sugarcane planting and harvest dates	ITK tab
Crop management	Irrigation	Irrigation management (yes or no)	ITK tab
Crop management	Mineral fertilization	N, P, and K mineral application dates and rates	ITK tab
Crop management	Sowing	Cover crop sowing dates, density, method, and row numbers	ITK tab
Crop management	Herbicide application	Details of each herbicide application date, type, and dose	ITK tab
Crop management	Manual weeding	Manual weeding dates and localization	ITK tab
Crop management	Mechanical weeding	Mechanical weeding dates and types	ITK tab

2.1. Experimental Design, Materials, and Methods

2.1.1. Experimental Network

Eight experiments were conducted over 11 years (Table 1). Five experiments were conducted on-station in the North of the Island on a Nitisol (WRB classification). One experiment was conducted on-farm in the East on a Ferralsol, and the last two were conducted in the West on an Andic Cambisol. Soil chemical characteristics were measured at the beginning of each experiment. The weather variables from the experiments were obtained from the Meteor software (https://smartis.re/METEOR), which interpolates daily weather variables from the Meteo France and CIRAD weather station network.

2.1.2. Experimental Design and Sugarcane Management

Each experiment consisted of a randomized-block sugarcane (*Saccharum officinarum*) plantation comparing at least three inter-row treatments: a weedy treatment with no weed control in

the sugarcane inter-row, a treatment with a cover crop sown each year in the inter-row and a treatment with complete chemical weed control. Some experiments included different levels of cover crop treatments (i.e., different cover crop species sown and compared to the same control treatment). Each treatment included two to four repetitions in plots ranging from 60 to 780 m^2 depending on trials (see Design file). The sugarcane was planted at a row distance of 1.5 m in all experiments. The planted cultivar varied depending on the experiment. All experiments were irrigated except for "Canecoh OF" in the East rainy part of the Island. NPK mineral fertilization was applied to ensure non-limiting conditions. In most trials, fertilization has been split with a first application one month after planting or harvest and a second at 2–3 months.

2.1.3. Weed Management

A pre-emergent herbicide was applied in the trials after sugarcane planting or harvesting. In the chemical control treatment, additional post-emergent herbicides were applied. During sugarcane growth, manual weedings of the sugarcane rows and a specific manual weeding of the most harmful weeds in all treatments were performed. In the cover crop treatment, additional manual weedings were occasionally performed when ground cover by weeds exceeded 30% of ground cover.

2.1.4. Cover Crop Management

13 cover crop species and crop mixture were tested in the experimental network. Cover crops were sown manually or mechanically in two to three lines depending on trials. The sowing date depended on trials. At the end of their development, cover crops died gradually with sugarcane closure or were destroyed. Sowing densities were determined based on previous studies and literature [29]. In the cover crop mixture, the sowing density of cover crops in pure was divided by the number of present species.

2.1.5. Field Measurements

Sugarcane yield (stalk fresh mass) was measured at harvest by sampling all sugarcane stalks on the two rows in the middle of the plot (i.e., a minimum of 30 m^2 areas). Sugarcane richness (% of fresh stalk mass) was measured with the near-infrared spectroscopy method [30]. The ground cover by cover crops and weeds was estimated using a visual notation method in the whole plot according to a rating scale ranging from 0 to 100% [29,31,32]. In each trial plot, ground cover by i) cover crops, ii) weeds, and iii) each weed species was performed every month during the first six months and then every two months up to the sugarcane harvest. Finally, the herbicide frequency application index was calculated as the sum of the ratio of the herbicide dose applied divided by the recommended dose across each herbicide application in a specific plot [33].

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Agroecological Practices to reduce wEED infestAtion In the tropicS (Original data) (Dataverse).

CRediT Author Statement

Billy Ngaba: Methodology, Software, Formal analysis, Writing – original draft, Writing – review & editing; **Mathias Christina:** Conceptualization, Methodology, Software, Data curation, Writing – original draft, Writing – review & editing; **Alizé Mansuy:** Conceptualization, Validation, Formal analysis, Investigation, Resources, Data curation, Project administration, Writing –

review & editing; **Julien Chetty:** Conceptualization, Validation, Formal analysis, Investigation, Resources, Data curation, Project administration, Writing – review & editing; **Mathilde Soulé:** Data curation, Validation, Writing – review & editing; **Marion Schwartz:** Data curation, Validation, Writing – review & editing; **Benjamin Heuclin:** Methodology, Software, Supervision, Writing – review & editing; **Sandrine Auzoux:** Conceptualization, Methodology, Software, Resources, Supervision, Project administration, Writing – review & editing.

Ethics Statements

This work does not contain any studies with human or animal subjects.

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References

[1] J. Chetty, A. Racoute, A. Mansuy, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2020-2021) - P41 Trial - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/SLGV2M.
[2] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2019-2020) - P41 Trial - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/WTFBBY.
[3] A. Mansuy, A. Racoute, M. Christina, Soulé, Mathilide, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2018-2019) - P41 Trial - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/1S0YSQ.
[4] A. Mansuy, A. Racoute, M. Christina, Soulé, Mathilide, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2017-2018) - P41 Trial - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/YUKJGB.
[5] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2015-2016) - P41 Trial - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/CLOJLC.
[6] A. Mansuy, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2014-2015), P41 Trial - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/6XYBVS.
[7] J. Chetty, A. Racoute, A. Mansuy, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2019-2020) - P25_Montagne Trial - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/B4EZZY.
[8] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2018-2019) - P25_Montagne Trial - CanecoH Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/UFMLLM.
[9] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2017-2018) - P25_Montagne Trial - CanecoH Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/L9ONHW.
[10] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2015-2016) - P25_LEG Trial - ECOCANNE Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/1JCZTI.
[11] A. Mansuy, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2014-2015) - P25_LEG Trial - ECOCANNE Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/2T3RII.
[12] A. Mansuy, T. Labrunie, M. Christina, Soulé, Mahilde, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2013-2014) - P25_LEG Trial - ECOCANNE Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/CXEKFC.
[13] M. Chabalier, T. Labrunie, M. Christina, Soulé Mathilde, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2012-2013) - P25_LEG Trial - ECOCANNE Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/MBWTAX.

[14] A. Mansuy, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2014-2015) - P25_ITK trial - ECOCANNE Project, CIRAD Dataverse, v2 (2022), doi:10.18167/DVN1/JUMMVK.
[15] M. Chabalier, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2011-2012) - P25_LEG Trial - ECOCANNE Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/SVXEQ6.
[16] M. Chabalier, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2013-2014) - P25_ITK Trial - ECOCANNE Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/EMLFCX.
[17] M. Chabalier, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of cover crops for weed control in sugarcane at La Mare (2012-2013) - P25_ITK Trial - ECOCANNE Project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/IRCSUR.
[18] J. Chetty, A. Racoute, A. Mansuy, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset for the evaluation of mechanical weed control methods with and without tillage (2019 - 2020) - P12 Trial - Projet AgriecoH, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/XR9BGQ.
[19] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset for the evaluation of mechanical weed control methods with and without tillage (2018 - 2019) - P12 trial - Projet AgriecoH, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/0LKVJU.
[20] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset for the evaluation of mechanical weed control methods with and without tillage (2017 - 2018) - P12 trial - Projet AgriecoH,, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/YFNLWM.
[21] J. Chetty, A. Racoute, A. Mansuy, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on alternative weeding practices (2019-2020) - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/PT4B04.
[22] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on alternative weeding practices (2018-2019) - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/K9ISTX.
[23] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on alternative weeding practices (2017-2018) - CanecoH project, CIRAD Dataverse, v2 (2022), doi:10.18167/DVN1/NWYEN6.
[24] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on alternative weeding practices (2016-2017) - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/I7JL0K.
[25] A. Mansuy, A. Racoute, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on alternative weeding practices (2015-2016) - CanecoH project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/I6PCSS.
[26] A. Mansuy, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of service plants to manage sugarcane weed infestation in Réunion Island (2013-2014) - ECOCANNE project, CIRAD Dataverse, v1 (2022), doi:10.18167/DVN1/SIN3SS.
[27] A. Mansuy, T. Labrunie, M. Christina, M. Soulé, B. Ngaba, S. Auzoux, Experimental dataset on the use of service plants to manage sugarcane weed infestation in Réunion Island (2014-2015) - ECOCANNE project, CIRAD Dataverse, v3 (2022), doi:10.18167/DVN1/4O7V30.
[28] S. Auzoux, E. Scopel, M. Christina, C. Poser, J.-C. Soulié, AEGIS, an extended information system to support agroecological transition for sugarcane industries, in: Proceedings of the XXX International Society of Sugar Cane Technologists Congress. ISSCT, Tucuman : ISSCT, Tucuman, Argentina, 2019, pp. 186–192. https://agritrop.cirad.fr/593440/. ISBN 978-616-92761-0-4.
[29] M. Christina, A. Negrier, P. Marnotte, P. Viaud, A. Mansuy, S. Auzoux, P. Techer, E. Hoarau, A. Chabanne, A trait-based analysis to assess the ability of cover crops to control weeds in a tropical island, Eur. J. Agron. 128 (2021) 126316, doi:10.1016/j.eja.2021.126316.
[30] M. Wang, X. Li, Y. Shen, M. Adnan, L. Mao, P. Lu, Q. Hu, F. Jiang, M.T. Khan, Z. Deng, B. Chen, J. Huang, M. Zhang, A systematic high-throughput phenotyping assay for sugarcane stalk quality characterization by near-infrared spectroscopy, Plant Methods 17 (2021) 76, doi:10.1186/s13007-021-00777-8.
[31] A. Mansuy, P. Marmotte, J. Martin, E. Roux, R. Chouteau, M. Wilt, G. Soubadou, CanécoH : mise au point de leviers pour une Canne à sucre économe en Herbicide à La Réunion, Innov. Agronom. 76 (2019) 103–119, doi:10.15454/tskwve.
[32] P. Marnotte, in: Influence Des Facteurs Agroécologiques Sur Le Développement Des Mauvaises Herbes En Climat Tropical humide., in: Colloque international Sur La Biologie, L'écologie et la Systématique des Mauvaises Herbes, Paris, 1984, pp. 183–189.
[33] N. Halberg, Indicators of resource use and environmental impact for use in a decision aid for Danish livestock farmers, Agric. Ecosyst. Environ. 76 (1999) 17–30, doi:10.1016/S0167-8809(99)00055-9.