University Academic Curriculum Vitae

Education since leaving school

- 1997 Degree in Environmental Sciences (Università Ca' Foscari di Venezia)
- 2001 PhD in Agricultural Ecology (Università degli Studi di Udine)

Present appointment

- Research Assistant
- From February 2025
- Free University of Bozen-Bolzano
- Digital Innovation Hub South Tyrol (DIS-HUB) PNRR – M4C2 – Investimento 2.3 –Potenziamento ed estensione tematica e territoriale dei centri di trasferimento tecnologico per segmenti di industria.

Professional experience

From / to	Job title	Name of academic Institution		
2023-2024	Research Assistant	Free University of Bozen-Bolzano		

- Value chains and complex systems performance analysis, with a focus on agri-food sector.
- Main methodological approaches: life cycle analysis and multi-actor multi-criteria analysis.
- Main topics: a) grape resistant wine varieties and b) smart agriculture technologies for plant protection

From / to	Job title	Name of academic Institution		
2022-present	Employee (2022) and freelance	Various companies and organisations		

- Analysis and modelling in sustainability, circular economy, bio-economy, production processes (industrial, environmental and agro-forestry), ecosystems, multi-criteria and multi-actor analysis
- Project management, innovation management, business analysis
- Analysis and design to support the development of digital solutions
- Systems modelling and development of specific calculation algorithms for applications in circular economy, industry 4.0 & 5.0, environmental and agro-forestry systems, smart agriculture, tourism
- Quantitative studies of systems and supply chains using established methodologies (e.g. Life Cycle Assessment, Multi-Criteria Analysis)
- Assessments and reporting according to international and national sector standards
- System thinking applied to complex systems and integrated sustainability
- R&D (European, national projects and in partnership with private companies)
- Dissemination for science and the general public

2016-2022	Senior Research Associate	Fraunhofer Italia scarl		

- Team Leader of the BES (Bioeconomy and Sustainability) Department
- Research focuses are Circular Economy, Bioeconomy and Sustainable Digitalization. As these issues are cross-sectoral in nature and influenced by a wide range of factors, addressing them requires an integrated multidimensional approach. This includes analytical and methodological tools to assess and develop business models for achieving industry-integrated sustainability goals

Main activities:
• Research & Development
• Project management (Horizon 2020, Interreg, ERDF, etc.) and projects' writing in the field of circular economy, rural development, smart agriculture, forestry, industry 4.0
• Indicators and strategies for tourism, energy, manufacturing and circularity of territories
• Industrial consulting in the field of sustainability, circular economy, sustainable tourism, business intelligence & information systems, industry 4.0 & sustainable industry
• Data Analysis

2011-2014	R&D manager, functional analyst, programmer analyst	Territorium Online		

▪ AEFIS project ("Studies and research on remote monitoring services for agri-environmental and forestry companies to support management and operational activities related to field processes", call for tenders Research and Development-Monalisa 2012, Autonomous Province of Bozen/Bolzano) in paternity with Free University of Bozen/Bolzano:
▫ project management
▫ analysis of the various system components (ontology, business processes, data acquisition devices, transmission, data base modelling, procedures, service architecture, test cases, documentation)
▫ development of data base structure and procedures (PostgreSQL/PostGIS)
▫ participation in the development of REST services (Java) for data logger-server and client-server communication
▫ participation in the formulation of calculation algorithms, implementation of calculation procedures and their integration into the system architecture

▪ Participation in the development of management applications with tasks of:
▫ requirements gathering and analysis
▫ modelling of relational databases using ER (Entity Relationship) and UML (Unified Modeling Language) tools and their development (PL/SQL, Oracle)
▫ analysis and design of business processes according to the BPMN standard
▫ development of desktop applications in Delphi 2009, based on the proprietary Apollo framework (GIS integration and provincial protocol (Autonomous Province of Bozen-Bolzano))
▫ documentation of functional specifications and drafting of user manuals
▫ realisation of test specifications and quality check
▫ provision of training and customer support via ticketing system
▫ some of the main applications for the Autonomous Province of Bozen-Bolzano Departments: NAIS (management of the activities of the Air and Noise office of the Provincial Environmental Agency), NuEs (management of the estimation practices of the Estimate office), WasserDefender (management of the activities of the Water Protection office of the Provincial Environmental Agency), WasserDomain (management of the activities of the Water Management office)

2005-2010	Freelance Research and technology transfer.	Various companies and organisations (among others University of Milan and University of Udine)		

Consultancy on modelling and informatics in agriculture, with design of new ontological models, database structures and informatics tools and implementation of algorithms and software prototypes for tools to support planning and tracking of activities (precision farming and husbandry) and strategic decisions (multi-criteria analysis).

Collaboration on various projects in the field of development and application of IT tools to agriculture:
▪ GPS surveys
▪ development of georeferenced thematic maps
▪ collection and processing of environmental data

ValorE project ("Expert systems for the valorisation of livestock manure, environmental protection and land protection in Lombardy"):
▪ participation in collection and analysis of requirements and in the testing phase
▪ participation in the definition and development of the system and individual constituent metamodels
▪ planning of the list of possible criteria to be used in benchmarking for both company and territorial scale analyses
▪ development and implementation of the multidimensional, multi-criteria and multi-attribute evaluation metamodel (Delphi2007)

Consultancy for the development of company databases of agricultural holdings, including all salient aspects that contribute to the management of agricultural processes, with specific analyses such as machine capacity and effluent monitoring.
Development of dedicated software for the management of the aforementioned databases; development of further software modules for the management of computerised management and precision agriculture applications. Most of the work was carried out within the framework of the Metamorfosi project, invitation to tender Metadistretti Industriali 2007, Regione Lombardia.
I was responsible for and personally handled the following activities:
▪ participation in requirements gathering and analysis
▪ design of data structures (for MS Access and SQLServer)
▪ spatial data analysis (Manifold, ArcView) and participation in simulation model design
▪ implementation of DB functionality and simulation models
▪ overall architecture and implementation of dedicated software
▪ desktop software package programming and server programming collaboration (Windows services), both in Delphi 2007
▪ development of user interface with GIS components for visualisation of thematic maps and tracks (with VeCAD integration)
▪ main applications developed: operational monitoring (farm management system with the possibility of planning activities in advance and processing of data collected in the field by special electronic devices for the automatic drafting of operations in the final balance, complete with analysis of actual and non-actual work times, per operation and per plot); effluent monitoring (monitoring and control of effluents stored and used on the farm, from data collected through special sensors and appropriately interpreted, with alert system for reaching the permitted thresholds on individual plots)

Planning and development of independent work:
▪ requirements analysis, modelling and development of relational databases using ER tools and UML
▪ development of desktop applications in Delphi, including specially designed and implemented calculation functions
▪ programming of electronic devices in proprietary languages

Projects (technological environment MS Access, Delphi2007):
▪ QCIOrti: computerised country notebook for managing documentation related to traceability functions of horticultural farm products, with integration of data acquisition systems by means of handhelds and barcodes
▪ Farm Simulator: Application for the management of data relating to the configuration of agro-livestock farms (in terms of equipment, materials and activities performed) with process simulation for the purpose of drawing up energy balances
▪ LSI: Computerised Stable Book for the management of stable books on sheep and goat farms, with integration of automatic systems for the identification of individual animals using RFID (Radio Frequency IDentification) devices
▪ CAOS: Realisation of a study to assess the possibility of applying chaos theory and complex systems in agricultural engineering disciplines

2001-2004	Research grant	University of Udine (1 year) University of Milan (2 years)		"

"Cultivation systems and protection of drinking water resources: a case study in the Upper Friulian Plain" as part of the national project (COFIN99) "Experimental research and multi-criteria analysis in the choice of cultivation systems in sensitive areas (1 year): analysis and modelling of agro-environmental systems; multi-criteria analysis applied to the evaluation of low environmental impact farm cultivation choices.

"Development and integration of software modules for the analysis of agricultural mechanisation and for the multidimensional assessment of farm choices" as part of the project "Information Technology Tools for the Eco-compatible Planning of Agricultural Enterprises" financed by the Ministry of Agriculture and Forestry (2 years): analysis and modelling of the agricultural enterprise; definition of an ontology specific to the agricultural enterprise; multi-criteria analysis applied to the assessment of strategic farm choices.

Experience in academic teaching

Module: Socio-economic aspects and assessments of hydro-geological risk with particular reference to information systems to support management; analysis and archiving of documentation.
Module: Socio-economic aspects and assessments of hydro-geological risk with particular reference to multidimensional integrated approaches in the analysis of interventions.

- 2nd level Master "HyRMA", Free University of Bolzano
- Role: professor
- Year: 2023

Memberships

- Guest Editor Special Issue "Digital Technologies as Enabling Strategies for the Sustainable Transition of Productive Systems. A special issue of Sustainability (ISSN 2071-1050). This special issue belongs to the section "Sustainable Products and Services".
  Deadline for manuscript submissions: 31 December 2024

- Member of Italian LCA Network Association (2024)

Research and scholarships

- Certified Circular Economy Specialist (Circular Economy Alliance, 2023)
- Life Cycle Assessment and SimaPro (2B, 2022)
- Certificate of completion Guida Pratica e Completa a Django, Python e BootstrapCertificate of completion Guida Pratica e Completa a Django, Python e Bootstrap (Udemy, 2021)
- Trained facilitator of LEGO® SERIOUS PLAY® method and materials (Michael Fearne, 2020)

Some of the more relevant projects and topics in the last 5 years:

- SUWIR - Towards sustainable viticulture: a case study on wines from resistant grape varieties in South Tyrol. It is an interdisciplinary research project of the Free University of Bozen-Bolzano aimed at studying the value of wines obtained from disease resistant grape varieties in the framework of a more ‘green’ and sustainable viticulture according to the 2030 goal of the EU to reduce pesticide use by 50%.

- AI algorithms to support sustainability balance sheets: feasibility studies for business logic algorithms for the production of sustainability balance sheets and the related certification process.
- Sustainable tourism: customised system for assessing the performance of hotel facilities with respect to the 17 SDGs of the 2030 Agenda.
- Bio-economy: technology transfer and feasibility studies, with a focus on the valorisation of production waste from a circular perspective.
- Circular economy assessment tool: CM-FLAT, circularity and maturity assessment tool for companies.
- AlpLinkBioEco: financed in the Interreg Alpine Space 2014-2020 programme. It aims to integrate bio-based supply chains in Alpine regions, boosting the competitiveness of the economy by enhancing circular and sustainable approaches.
- Wequal: financed in the ERDF 2014-2020 programme. Development of a system to support the design and environmental monitoring of various types of hydraulic solutions, through the creation of an Integrated Environmental Assessment System based on ICT infrastructures and advanced detection/monitoring systems.
- Brotweg: financed in the 2014-2020 ERDF programme. It proposes and evaluates new mechanised solutions for the cereal sector in high mountain areas with a focus on the sustainability of the supply chain and the possibility of environmental certification.
- SmartPro: financed under the ERDF 2014-2020 programme. Study of indicators and methodologies to introduce and measure sustainability in production systems and support sustainable business models.

Publications

ORCID: 0000-0002-7298-1165

1. Mazzetto F., Carabin G., *Sacco P.* (2024). Il quadro applicativo dell'agricoltura di precisione: dall'automazione ai sistemi informativi aziendali e alla robotica. In: Agricoltura di precisione. Metodi e tecnologie per migliorare l'efficienza e la sostenibilità dei sistemi colturali, 2nd Edition, Casa R. (Ed.), Edagricole. ISBN 978-88-506-5669-1

2. *Sacco P.,* Orzes G. (2024). Analysis of the potential contribution of the disease-resistant grape varieties to sustainable agriculture: a case of study of South Tyrol. Poster at OpenLCA Conference, Berlin, Germany

3. Todescato M., Braholli O., Chaltsev D. Di Blasio I., Don D., Egger G., Emig J., Pasetti Monizza G., *Sacco P.,* Siegele D., Steiner D., Terzer M., Riedl M., Giusti A., Matt D. (2023). Sustainable manufacturing through application of reconfigurable and intelligent systems in production processes: a system perspective. Sci Rep 13, 22374. https://doi.org/10.1038/s41598-023-49727-5

4. Rangoni Gargano E., Cornella A., *Sacco P*. (2023). Governance Model for a Territory Circularity Index. Sustainability 15(5). DOI: 10.3390/su15054069

5. *Sacco P*., Don D., Becce L., Mandler A., Carabin G., Mazzetto F. (2022). Sustainability performance of mountain food value chains. V. Ferro et al. (eds.), AIIA 2022: Biosystems Engineering Towards the Green Deal Lecture Notes in Civil Engineering 337. https://doi.org/10.1007/978-3-031-30329-6_92

6. Rangoni Gargano E., Cornella A., *Sacco P.* (2022). Sustainable company performance: an analysis of the different existing assessments for measuring Sustainability and Circular Economy at SME level. R&D Management Conference, Trento, Italy

7. Mazzetto F., Becce L., Carabin G., Mandler A., *Sacco P*. (2022). Technological solutions for implementing sustainable cereal-based value chains in high mountain areas. V. Ferro et al. (eds.), AIIA 2022:

Biosystems Engineering Towards the Green Deal Lecture Notes in Civil Engineering 337. https://doi.org/10.1007/978-3-031-30329-6_75

8. *Sacco P.*, Vinante C., Borgianni G., Orzes G. (2021). Circular Economy at the Firm Level: A New Tool for Assessing Maturity and Circularity. Sustainability, 13(9), 5288. https://doi.org/10.3390/su13095288

9. Vinante, C., *Sacco, P.*, Orzes, G., Borgianni, Y. (2021). Circular economy metrics: Literature review and company-level classification framework. Journal of Cleaner Production, 288. https://doi.org/10.1016/j.jclepro.2020.125090

10. *Sacco P.*, Gargano E.R., Cornella A., Don D., Mazzetto F. (2021). Digital sustainability in smart agriculture. 2021 IEEE International Workshop on Metrology for Agriculture and Forestry, MetroAgriFor 2021 - Proceedings, pp. 471-475. DOI: 10.1109/MetroAgriFor52389.2021.9628838

11. Egger G., *Sacco P.*, Chaltsev D., Mazzetto F. (2021). FarMAS: Multi-Agent based farm activity planning and execution system. 2021 IEEE International Workshop on Metrology for Agriculture and Forestry, MetroAgriFor 2021 - Proceedings, pp. 411-415. DOI: 10.1109/MetroAgriFor52389.2021.9628826

12. *Sacco P.*, Rangoni Gargano E., Cornella A. (2021). Sustainable Digitalization: A Systematic Literature Review to Identify How to Make Digitalization More Sustainable. In: Borgianni, Y., Brad, S., Cavallucci, D., Livotov, P. (eds) Creative Solutions for a Sustainable Development. TFC 2021. IFIP Advances in Information and Communication Technology, vol 635. Springer, Cham. https://doi.org/10.1007/978-3-030-86614-3_2

13. Mayr S., Brozzi R., Cervellieri A., Desaler T., Gallo R., Gamper J., Geier B., Holzner L., *Sacco P.*, Mazzetto, F. (2020). Brotweg - A Path of Bread in an Alpine Environment: New Mechanical Solutions for Grain Processing in Steep Mountain Slopes. Lecture Notes in Civil Engineering, 67, pp. 449-456. DOI: 10.1007/978-3-030-39299-4_50

14. Mazzetto F., Gallo G., and *Sacco P.* (2020). Reflections and Methodological Proposals to Treat the Concept of "Information Precision" in Smart Agriculture Practices. Sensors, 20(10), 2847. https://doi.org/10.3390/s20102847

15. Mazzetto F., *Sacco P*. (2019). A methodological proposal to assess the information reliability in the Precision Agriculture decisional chains. 2019 IEEE International Workshop on Metrology for Agriculture and Forestry, MetroAgriFor 2019 - Proceedings, art. no. 8909230, pp. 317-322. DOI: 10.1109/MetroAgriFor.2019.8909230

16. *Sacco P.,* Gallo R., Mazzetto F. (2019). Data analysis and inference model for automating operational monitoring activities in Precision Farming and Precision Forestry applications. IOP Conference Series: Earth and Environmental Science, 275(1). DOI: 10.1088/1755-1315/275/1/012013

17. Gallo R., Carabin G., Vidoni R., *Sacco P.*, Mazzetto F. (2018). Solutions for the automation of operational monitoring activities for agricultural and forestry tasks. Bodenkultur, 69 (3), pp. 131-140. DOI: 10.2478/boku-2018-0012

18. Mazzetto F., Gallo R., Importuni P., Petrera S., *Sacco P.* (2017). Automatic filling of field activities register, from challenge into reality. Chemical Engineering Transactions, 58, pp. 667-672. DOI: 10.3303/CET1758112

19. Fumagalli M., Bechini L., Mazzetto F., *Sacco P.*, Vidotto F., Sali G., Bulgheroni C., Pastori M., Acutis M. (2008). Survey and optimization of nitrogen management in farming and cropping systems. Italian Journal of

Agronomy, 3 (3), pp. 149-150

20. Fumagalli M., Bechini L., Mazzetto F., *Sacco P.*, Acutis M., Brenna S. (2008). Can the reduction of nitrate leaching decrease the consumption of fossil energy? Italian Journal of Agronomy, 3 (3), pp. 329-330

21. Marchiol L., Assolari S., *Sacco P.*, Zerbi G. (2004). Phytoextraction of heavy metals by canola (Brassica napus) and radish (Raphanus sativus) grown on multicontaminated soil. Environmental Pollution, 132 (1), pp. 21-27. DOI: 10.1016/j.envpol.2004.04.001

22. Marchiol L., *Sacco P.*, Assolari S., Zerbi G. (2004). Reclamation of polluted soil: Phytoremediation potential of crop-related BRASSICA species. Water, Air, and Soil Pollution, 158 (1), pp. 345-356. DOI: 10.1023/B:WATE.0000044862.51031.fb

23. Wenzel W.W., Unterbrunner R., Sommer P., *Sacco P.* (2003). Chelate-assisted phytoextraction using canola (Brassica napus L.) in outdoors pot and lysimeter experiments. Plant and Soil, 249 (1), pp. 83-96. DOI: 10.1023/A:1022516929239

Further data

Teaching in the Project “Green operator in the wine sector“ (European Social Fund) on the topics (modules): a) Life Cycle Assessment, b) New technologies for crop management and monitoring and c) Digitisation in the wine sector (2024-2025).

Special session organizer: The role of digitization in agricultural sustainability 2021 IEEE INTERNATIONAL WORKSHOP ON Metrology for Agriculture and Forestry, November 3 - 5, 2021 – Trento-Bolzano (Italy).

Selected presentations:

- Digital sustainability in smart agriculture, Metroagrifor 2021.
- Sustainability performance of mountain food value chains, Biosystems engineering towards the green deal 2022.
- Fraunhofer Trend Dialog - Le nuove frontiere del digitale sostenibile (Original language Italian), 2022; https://www.youtube.com/watch?v=r9chXrZUaAY
- Sustainability Days Alto Adige - Indice di circolarità territoriale (Original language Italian), 2022; https://www.youtube.com/watch?v=IQ_bE1_wWZs

Entrepreneurship

Founding partner of an innovative startup (2015-2016) for the marketing of services for the agri-environmental sector based on electronic and IT products, with a focus on the technical and cultural aspects of accepting new technologies as support and improvement of business management activities; this by intervening in the data-information cycle upstream of decision-making processes to simplify the impact of large volumes of data on end users:
▫ innovation management
▫ project management
▫ projects on European and national funds
▫ system and business logic analysis
▫ development of data base structure and procedures (PostgreSQL/PostGIS)
▫ development of REST services (Java)
▫ formulation of calculation algorithms, implementation of calculation procedures and their integration into the system architecture

Statement of interest

For several years, I have been involved in the study and modelling of natural and anthropic systems, even interacting with productive processes. My solid background in smart and digital agriculture will allow me to get into the domain processes in order to analyse them for the specific activities foreseen. This is reported by the several experiences of collaboration with research organisations (unibz, unimi, uniud, Fraunhofer Italia) I had in the last 15 years.
Furthermore, I have been involved in the assessment of the performance of production systems (agricultural, industrial and services) both by using specific consolidated techniques (e.g. LCA) and by developing assessment tools (e.g. CM-FLAT, SDG assessment for hotels, performance of agricultural activities and other specific customised algorithms) at the theoretical and implementation level (creation of software prototypes). These competences are perfectly in line to support the activities concerning the analysis and continuous monitoring of the training needs of agribusiness, manufacturing and service companies (with particular reference to artificial intelligence). The skills gained with regard to interaction with companies and teaching on issues related to digitization, and as analyst and software developer, is in line with the planned activities of designing advanced lifelong learning and learning-on-platform didactic modules in collaboration with various unibz faculty and project partners. Finally, the experience gained in international research projects goes to support the other activities envisaged in the call.

Language competence

Mother tong: Italian

English: Listening (C1), Reading (C1), Spoken interaction (B2), Spoken production (B2), Writing (B2)
German: Listening (C2), Reading (C2), Spoken interaction (C1), Spoken production (C1), Writing (B2)
French: Listening (B2), Reading (C1), Spoken interaction (B2), Spoken production (B2), Writing (B2)

Self-evaluation according to CEF