

  UNIVERSITÉ DE LORRAINE		Created : 01 January 2018
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SILVATECH ACCESS CHARTER		

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1. Presentation

SILVATECH is a national facility dedicated to the analysis of forest ecosystems and wood. The range of techniques and methods developed enables integrated approaches from the molecular to the plot scale, with the capacity to decipher the structures, properties, and functions of the tree within its ecosystem, up to wood as a material.

SILVATECH is jointly operated by UMR SILVA (1434), UMR BEF (1138), UMR IAM (1136), and USC LERMAB (EA 4370), under the supervision of INRAE (ECODIV research department), the University of Lorraine, and AgroParisTech. It is part of the national research infrastructures [IN-SYLVA-France](#) and IN-SYLVA-UE.

SILVATECH provides analytical expertise and development capacity to regional, national, and international research units through strong support for integrative research programs (ecology, ecophysiology, biogeochemistry, functioning of forest, grassland, and aquatic ecosystems, dendrometry, wood anatomy and properties, and structure–property relationships in wood as a material). It plays an increasingly important role in national and international networks, in regional and European training initiatives, and in attracting international researchers.

From an operational perspective, SILVATECH is organized into two interconnected divisions:

- ✓ Isotope–Chemistry unit (IC): coupling of spectrometry, chromatography, isotopy, ablation, and plasma techniques dedicated to the analysis of molecules in complex matrices (wood, sap, soil, water).
- ✓ Multi-Modal Imaging and Measurement unit (I3M): high-resolution electron and confocal imaging, cryo-electron microscopy, mineral X-microanalysis, histology and light microscopy, radiography, X-ray tomography and diffraction, hyperspectral imaging, laser microdissection.

These two units are also supported by workshops for sample preparation (microtomy and cryomicrotomy, lyophilization, metallization, grinding, micro-weighing, extractions) and design (wood, mechanics, additive manufacturing).

For more information, please contact us at silvatech@inrae.fr visit our website at <https://silvatech.isc.inrae.fr/> or follow us on our social networks : [X](#), [Bluesky](#) or [Linkedin](#).

2. Service Catalogue

Silvatech Units	Type de service	Preparation	Technology	Méthods/parameters
Isotopy- Chemistry Unit	Isotopy BSIA (natural/enriched)	Execution and training in : grinding, cutting, micro-weighing, cryoextraction, extraction and purification, derivatization	Pyr-EA-IRMS (solid)	$\delta^{13}\text{C}$ $\delta^{15}\text{N}$ δD $\delta^{18}\text{O}$ + C N O H
			Pyr-EA-IRMS or IRIS/laser (liquid)	δD , $\delta^{18}\text{O}$
	GA-IRMS (gas)		$\delta^{13}\text{C}$ -CO ₂ $\delta^{13}\text{C}$ -CH ₄ $\delta^{15}\text{N}$ -N ₂ O	
	ICP-MS (liquid)		$\delta^{44}\text{Ca}$ $\delta^{26}\text{Mg}$	
	LC/GC-C-IRMS (molecules)		$\delta^{13}\text{C}$, $\delta^{15}\text{N}$ (sugars, amino acids or sugars, PLFA...)	
	EA (solid)		C N H S	
	ICP-OES/MS (liquid)		trace, ultra-trace and metal elements	
	Biochemistry		Spectro-photo-fluoro-metry (liquid extraction)	total soluble sugars, glucose, fructose, sucrose, starch, total amino acids, proline, proteins, total phenols
IC and GC-MS		sugars, amino sugars , lipids (FAME)		
Multi-units	Design and fabrication	Execution and training in : 2D and 3D models	Wood and Mechanical Workshops (CNC milling machines, band saws, twin blades, sanders, jointer-planer, etc.) Additive manufacturing workshop (SLA, FDM, laser cutter)	plans, 2D and 3D models, parts, sensors, and prototypes for use in field or laboratory experiments
	Multi-scale microanalyses (µm–cm)		SEM detectors (EDS, WDS, EDX) ITRAX (X-ray fluorescence) LA-ICP-MS	chemical element mapping
Imaging and Multi-Modal Measurements Unit	Scanning Electron Microscopy (high resolution, cryo-methods, Peltier stage, variable T°/P conditions)	Execution and training in : sampling, coring, cutting, sawing/machining, pelletizing, lyophilization, embedding, metallization	Conventional observation	identification / quantification of anatomical structures (nm–cm), high-resolution image reconstruction, image stitching (large surfaces µm ² –dm ² / high resolution), measurement of ring widths (earlywood, latewood), stomatal density, identification of combined physical, biological, and chemical structures
			Controlled Pressure	
			Variable Pressure	
			Correlative microscopy (Photonic-SEM, SEM-SEM, confocal-SEM)	
	Photonic Microscopy (transmission, reflection, fluorescence)		Images acquisition Station	images stitching (large surfaces µm ² –dm ² / high resolution), depth-of-field observations (Z stack), measurement of ring widths (earlywood, latewood), dendrochronology, identification / quantification of anatomical structures
			AxioImager M2	
			MacroZoom	
	Histology / preparation for observations		Dendrometry Station	execution and training in the production of cubes (cm) or slides dedicated to plant histology, wood anatomy, and monitoring of wood formation
			Surfacing, sectioning and staining on micro-cores and plant samples, cryotomy, vibratome sectioning	
	Hyperspectral imaging		Hyperspectral sensors VNIR + SWIR	wood chemometrics (wavelength range 400–2500 nm)
	Microdensitometry (radiography)		ITRAX (solid)	2D density gradients, characterization of ring structure (e.g., microdensitometric analysis of wood)
	X-ray Tomography		XR CT-scan	2D and 3D density gradients
	Diffractionometry		X-ray diffraction on wood and plant tissues (Wide-angle X-ray scattering (WAXS))	microfibril angle and Cristallinity Index of cellulose
Physical and mechanical properties caracterization (destructive or non-destructive)	Mechanical testing machine (solid mm–cm)	modulus of elasticity specific modulus		
	Vibratory methods BING, VYBRIS (solid mm–cm)	damping coefficient		

SILVATECH makes available to users the full range of techniques required for sample preparation at the INRAE site located in Champenoux (FR 54280). These services can be accessed by appointment with the technical contacts or via the platform's website using the reservation request tools. In line with our quality management system, we have implemented regular monitoring of our equipment through scheduled calibrations and verifications. A complete description of the preparation and analysis/measurement/observation tools, as well as recommendations for sampling or sample preparation and the contact details of staff members for further information, can also be found on the platform's website.

3. Staff

For any request, please contact the SILVATECH mailbox at silvatech@inrae.fr. In addition, the table below provides an overview of the appropriate contacts depending on the subject.

Work Requests, Development, Quotation and Projects	Contact
IC coordinators	bastien.gerard@inrae.fr and loic.louis@inrae.fr
I3M coordinators	julien.ruelle@inrae.fr and christophe.rose@inrae.fr
SILVATECH coordinators	nicolas.angeli@inrae.fr and julien.ruelle@inrae.fr
Technical or Informations	Contact
Quality management	carole.antoine@inrae.fr and maryline.harroue@inrae.fr
Billing management	laurence.lemaout@inrae.fr
HR and recruitment	nathalie.bisseux@inrae.fr
Grinding workshop	carole.antoine@inrae.fr
Weighing and microweighing	carole.antoine@inrae.fr and christian.hossann@inrae.fr
Cryoextraction	christian.hossann@inrae.fr
Gaz sampling and cryoextraction	christian.hossann@inrae.fr
C/N isotope analysis	christian.hossann@inrae.fr
H/O isotope analysis	loic.louis@inrae.fr
Compound specific isotope analysis	loic.louis@inrae.fr and nicolas.angeli@inrae.fr
Biochemistry	bastien.gerard@inrae.fr and carole.antoine@inrae.fr
C/N/H/S analysis	carole.antoine@inrae.fr
Mineral analysis (trace/ultra-trace)	benoit.pollier@inrae.fr
Scanned electron microscope	christophe.rose@inrae.fr and laura.figel@inrae.fr
Microanalysis	christophe.rose@inrae.fr and laura.figel@inrae.fr
Histology et optical microscopy	maryline.harroue@inrae.fr and adeline.motz@inrae.fr
Wood machining	emmanuel.cornu@inrae.fr and sylvain.huart@inrae.fr
Metal machining	bruno.leclerc@inrae.fr
Microdensitometry	emmanuel.cornu@inrae.fr and julien.ruelle@inrae.fr
X-Ray tomography (scanner)	charline.mola@inrae.fr and etienne.farre@inrae.fr
X-Ray diffraction	sylvain.huart@inrae.fr and julien.ruelle@inrae.fr
Impression 3D modelling and additive printing	sylvain.huart@inrae.fr and nicolas.angeli@inrae.fr

4. Access Policy

✓ Supporting the technical planning of research projects to ensure better execution.

Research and development projects involving SILVATECH must be discussed in advance with the coordinators of the relevant units before project submission, in order to define the technical and methodological organization (staff time, schedules, protocols, processing, costs). A copy of the submitted project (or internship topics) must be sent to SILVATECH at silvatech@inrae.fr. Project leaders must also inform SILVATECH, as early as possible, whether project funding has been accepted or not, using the same address. Projects following this procedure will be systematically prioritized. SILVATECH reserves the right to refuse projects designed independently of these recommendations.

✓ Ensuring traceability of requests on an annual or multi-year basis.

In addition to email or telephone exchanges with platform staff, each project leader must complete a written work request form specifying the scientific, technical, and organizational details necessary for project management. The document is available on the facility's website and may be completed and submitted during the annual call for projects or at any time as required.

At the project leader's request, a submission may be postponed to the following year. No sample preparation or analysis/measurement activity may begin without a prior work request. SILVATECH will provide, in return, a quotation and a unique project code.

This project number must be retained and communicated to facility staff during future exchanges. It will allow the traceability of all phases of preparation, analysis, and storage of samples and results. It will also be required by staff in charge of sample preparation.

✓ Ensuring transparent access to services.

All projects submitted to SILVATECH will be systematically reviewed before validation. The infrastructure managers will assess the project's alignment with the facility's fields of expertise and thematic scope. When needed, SILVATECH may consult its Scientific Expert Council for guidance on strategic, ethical, or legal matters.

Unit coordinators will evaluate the technical feasibility of the projects (ability to prepare/measure/observe the requested indicators, handling of sample matrices, sample hazards), any development requirements, as well as the necessary time and costs. They will also examine the compatibility of the requests with schedules and ongoing commitments and may provide recommendations to applicants to facilitate access (sampling, preparation, preservation, volumes, deadlines, etc.).

Finally, in cases where confidentiality or contractual partnership issues arise, the facility will rely on the Partnership, Transfer, and Innovation Services of the INRAE Grand-Est Nancy Center and the ECODIV department.

Acceptance of the project will be notified to applicants by the SILVATECH unit coordinators. In return, applicants commit to complying with all the provisions outlined in this document. In case of

refusal, the facility will, whenever possible, suggest alternative solutions by redirecting applicants to other infrastructures better suited to their request.

5. Safety of Staff, Samples et Equipment

✓ Ensuring compliance with safety regulations in order to control risks to individuals, property, and experiments.

All persons working on SILVATECH premises must hold either a mission order, an employment contract, or a hosting agreement.

Within facilities managed by SILVATECH, contractual and permanent staff will carry out their activities under the responsibility of the facility's agents. The latter are responsible for providing training and ensuring compliance with defined working conditions (safety, quality and traceability, organization, schedules and access), INRAE's applicable charters (infrastructure, ethics, IT, open data), and the regulatory framework of labour law. They may, if deemed necessary, interrupt any activity that jeopardizes the integrity of staff, samples, measurements, equipment, or data through non-compliance with these requirements.

The facility is committed to training and supervising hosted personnel in the steps of sample preparation prior to analysis, measurement, or observation, in accordance with applicable quality procedures and associated hygiene and safety rules. All technical equipment, documentation, and protective gear will be provided by SILVATECH. In return, hosted personnel commit to respecting all rules and procedures of the platform throughout their stay and to contributing to the maintenance of the existing quality management system.

In certain cases, and for regulatory safety reasons, access to specific techniques (e.g., machine tools, X-ray scanners) will be restricted and managed exclusively by qualified platform staff.

✓ Ensuring traceability and quality of samples, information, and materials during preparation/measurement processes

All raw or processed samples submitted to SILVATECH for measurements must be accompanied by a digital list of samples, an explanation of any acronyms used, and key experimental details (treatment, species, batches, etc.). This list must be sent by email to silvatech@inrae.fr prior to the arrival of the samples. Failure to provide this list will automatically block the preparation and measurement steps.

Samples brought to the SILVATECH facility remain under the responsibility of the requester. It is therefore their duty to report any known contamination or hazards (metals, organic compounds, carcinogens, mutagens, biological risks, radioactivity, etc.) at the time of the work request.

For samples sent by courier, the facility will provide prior recommendations (address, packaging, tracked shipment), but cannot be held responsible for any sample degradation during transport. For samples coming from abroad, the scientist must comply with current European documents regarding sample import into France (phytosanitary passport, official authorization letter). Any shipping and customs fees will be the responsibility of the requester.

Once preparation is completed, the requester is responsible for collecting and/or disposing of any remaining samples. The facility may offer storage and preservation solutions beyond the project duration, depending on the volume of samples.

✓ Protecting and ensuring the durability of equipment

Experiments using isotopically labelled compounds are essential for many research programs, and SILVATECH aims to meet these needs for its research community. However, isotopic labelling levels above 3000‰ present significant issues:

- ✓ No standard is available to verify result linearity, correct data, or normalize values to international scales.
- ✓ Memory effects may occur, compromising subsequent analyses in the series.
- ✓ At very high labelling levels, detectors may saturate and deteriorate, potentially impairing isotopic measurements at natural abundance or low concentration required by other users.
- ✓ Reactors and traps may need to be completely disassembled to replace all reagents, disrupting schedules and causing significant additional costs.
- ✓ Labelled products are very costly and could be used at more diluted concentrations

For these reasons, researchers working with isotopic labelling must provide SILVATECH with their isotopic dilution calculations and an evaluation of expected labelling levels, based on their own experience or published literature.

In cases where isotopic measurements exceed 3000‰, an additional fee of €5 (excluding VAT) per sample will be applied, and SILVATECH reserves the right, as do many other isotope laboratories, to refuse further analysis of the remaining samples.

6. Data Policy

✓ Ensuring the Long-Term Security of Public Research Data

As part of its Data Management Plan, the SILVATECH facility is committed to securing the research data produced within the infrastructure during and beyond the lifetime of each research project.

To achieve this, at the start of every project and for its entire duration, a storage space will be created on an INRAE national server. All raw and processed data and files generated by SILVATECH during the project will be stored there and preserved for 5 years, ensuring that the project leader may request extended access if needed.

The Data Plane Management of Silvatech is available on Data Gouv:

Angeli, Nicolas; Gérard, Bastien; Ruelle, Julien; Farré, Etienne, 2025, "Plan de Gestion de Données plateforme Silvatech V2", <https://doi.org/10.57745/RZGL8Z>, Recherche Data Gouv, V1

Ensuring Accessibility and Openness of Public Research Data

In line with INRAE's charters on open access to data and research infrastructures, SILVATECH has implemented a Data Management Plan that integrates principles of accessibility and data reusability.

To this end, the facility is committed to making data file formats produced during projects as compatible as possible with open, non-proprietary standards, and to documenting available analytical metadata.

This enables project leaders and research units, through their own Data Management Plans, to easily integrate this information with other metadata and experimental/scientific datasets, and to deposit complete, coherent, and relevant datasets on appropriate repositories (e.g., INRAE Dataverse).

The facility will also make available on its INRAE Dataverse space datasets acquired outside of specific projects (such as image banks, intercalibration datasets, or those from dedicated developments). This ensures that each dataset can be identified through a unique DOI and that its reuse can be tracked.

Such measures also contribute to long-term preservation and secure archiving of datasets, extending beyond the 5 years guaranteed by SILVATECH.

These procedures may be adapted in cases where specific confidentiality agreements or data embargoes are defined with partners and INRAE Partnership, Transfer, and Innovation engineers during project setup or access requests to SILVATECH.

SILVATECH's Data Management Plan is available on the platform's website, in the DMP OPIDoR application, and on our Dataverse space.

Learn more about INRAE's open data policy via [this link](#).

7. Financial and Partnership Policy

✓ Ensuring financial traceability for each project and providing the infrastructure with budgetary visibility to anticipate expenditures and investments.

For projects involving SILVATECH as a partner, funds must be allocated at the request of the project leader at the beginning of each annual budget cycle. For multi-year projects, this procedure must be repeated at the start of every year.

For projects in which SILVATECH acts as a service provider, the rates quoted in the estimates will apply according to the source of the funds, not the researchers' affiliation. This is justified by the management fees charged by INRAE on external income (CNRS, CIRAD, universities, etc.).

The minimum billable amount is €300 (excluding VAT), but several services may be grouped together to reach this threshold. For amounts exceeding €15,000 (excluding VAT), a prior agreement must be established. Our project partnership engineers will then provide support.

Only upon prior receipt of a purchase order in PDF format (or a signed quotation bearing the statement "approved for agreement"), or upon allocation of funds to the facility's budget line, will measurements or observations be initiated. Invoicing will be carried out when the results are sent to the project leader, via the INRAE management software.

The facility may, in some cases, accept the early allocation of funds, but cannot under any circumstances guarantee their rollover beyond year N+1 following the initial request. Funds allocated must therefore be used within this timeframe; otherwise, they will be forfeited.

✓ Ensuring a transparent pricing policy in compliance with fair competition rules.

The full costs calculated include direct costs (consumables, products, reagents, special fluids, standards, traceability/safety, packaging, and storage) and indirect costs (maintenance and depreciation of equipment, management of breakdowns, general expenses and utilities, data management, headquarters overheads), as well as staff time.

On the basis of these full costs, SILVATECH defines a tax-exclusive pricing policy with four levels:

- ✓ Private or international partners (full-cost model)
- ✓ Academic partners outside INRAE
- ✓ INRAE partners
- ✓ Internal users (UMR SILVA, BEF, IAM, LERMAB)

The proposed rates ensure SILVATECH's long-term, stable operation and will be adjusted according to changes in cost items used in the calculation.

No specific discount will be applied by the platform in cases of co-publication or individual involvement in projects. For specific work requiring development or greater involvement of users (e.g., training on analysis/measurement/observation equipment), SILVATECH reserves the right to

propose a flat fee to the requester. INRAE is subject to VAT and applies it in accordance with current regulations.

8. Policy on Acknowledgment and Citation Traceability

✓ Assessing the impact of projects supported by SILVATECH and the added value provided by the infrastructure to research communities.

Researchers using SILVATECH for their projects commit to systematically acknowledging the infrastructure in their publications and communications, in accordance with the rules defined in the access charter, and to sending either a .pdf copy or a link to all related outputs (publication, thesis, poster, or presentation) no later than their dissemination, to silvatech@inrae.fr. Compliance with this rule will be considered when prioritizing projects.

✓ Standardizing citations to ensure better traceability of scientific outputs.

Like all research infrastructures, SILVATECH is assessed through indicators of scientific output, such as the publications to which it is linked. This relevance ensures its long-term sustainability, its visibility, and that of its staff. It is therefore important for the facility to guarantee rigorous traceability of the dissemination of results. In order to harmonize SILVATECH's citation practices, the following rules are proposed:

Any scientist using SILVATECH for the preparation and/or analysis, measurement, or observation of samples and the provision of associated data agrees to systematically cite SILVATECH in the acknowledgments section of the publication, as follows:

« The author(s) would like to thank SILVATECH (Silvatech, INRAE, 2018. Structural and functional analysis of tree and wood Facility, doi: 10.15454/1.5572400113627854E12) from UMR 1434 SILVA, 1136 IAM, 1138 BEF and 4370 EA LERMAB research Center Grand-Est Nancy for its [contribution/participation...] [to isotopic-chemical-image analysis / to microscope-X-ray tomographic observation / microanalysis / to provide data / to methodological development,...]. SILVATECH is a part of the French National Infrastructure IN-SYLVA France (<https://doi.org/10.15454/1a0p-he21>). »

Furthermore,

The author agrees to indicate SILVATECH's contribution in bibliographic reference databases in the appropriate fields (Dataverse, HAL, etc.).

When the contribution of one or more SILVATECH staff members goes beyond the aforementioned scope (significant participation in the development/transfer of new methods leading to the publication, pre-processing and/or interpretation of data, drafting of certain elements of the publication, etc.), in addition to citing SILVATECH in the acknowledgments, the first author of the publication agrees to include the SILVATECH staff member(s) as co-author(s), in the order generally accepted by the scientific discipline, the journal, or customary practice.

e.g.: Charline Mola ⁽¹⁾

⁽¹⁾ *Université de Lorraine, AgroParisTech, INRAE, SILVA, F-54000 Nancy, France*