INNOECOFOOD - Eco-innovative technologies for improved nutrition, sustainable production and marketing of agroecological food products in Africa

Grant agreement no: 101136739

Deliverable D8.13

UPDATED DATA MANAGEMENT PLAN – M18

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Start date of the project: 01/01/2024 **Duration: 36 months**

Organisation name of lead contractor: CIIMAR - Centro Interdisciplinar de Investigação Marinha e Ambiental

Project co-funded by the European Commission within the Horizon Europe Programme
Dissemination Level

PU Public	X
SEN Sensitive, only for members of the consortium (including the Commission Services)	

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EXECUTIVE SUMMARY

The INNOECOFOOD Updated Data Management Plan (D8.13) provides a comprehensive overview of how project data has been managed, shared, and safeguarded up to Month 18, building on the foundations established in D8.1.

INNOECOFOOD is a multi-actor EU-AU project focused on establishing innovative production and business ECOHUBs for aquaculture, spirulina, and insect value chains in six African countries. This plan describes the full life cycle of the project's diverse datasets, spanning baseline surveys, AI and IoT sensor streams, laboratory analyses, training materials, and communication outputs. Since the original DMP (D8.1), significant progress has been made:

- Baseline survey data has been collected and cleaned across all target countries.
- Sensors are operational in Living Labs and ECOHUBs, feeding real-time data into centralised secure systems.
- Training modules, micro-lessons, and educational resources have been developed and digitised.
- Synology Drive and MariaDB provide secure storage and controlled access for partners.
- Open access publication workflows using Zenodo and the virtual ECOHUB platform are active.
- The IIPC and Communication Committees are implementing robust review processes to protect intellectual property and confidentiality.
- National and institutional ethics approvals have been finalised, with SOPs guiding local implementation.
- FAIR principles — Findable, Accessible, Interoperable, Re-usable — are actively applied through standardised metadata, consistent formats, and open sharing wherever feasible.

This updated plan confirms that all partners are complying with Horizon Europe open science guidelines, ethical requirements, and the Grant Agreement. It also sets out practical measures for long-term data preservation, risk management, and knowledge transfer to maximise the project's value for local communities, policymakers, industry stakeholders, and researchers.

The DMP will continue to be updated as INNOECOFOOD progresses, ensuring that all datasets remain well-managed, secure, and impactful.

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We have to note that The plan is a living document, to be updated throughout the project based on identified needs or adjustments.

INTRODUCTION

This Updated Data Management Plan (D8.13) sets out how data generated by the INNOECOFOOD project will be collected, stored, managed, protected, disseminated and preserved, in full compliance with Horizon Europe open science requirements, ethical standards, and the Grant Agreement. This document builds on the initial plan (D8.1) by reflecting the progress made by Month 18, clarifying procedures, and confirming practical steps for long-term knowledge sharing and impact.

Background of the INNOECOFOOD Project

INNOECOFOOD aims to establish innovative production and business ECOHUBs and improve local aquaculture farms through the application of AI and IoT in six African countries. To support EU-AU markets and trade, the project trains rural farmers, youth and women to produce and process nutritious aquaculture catfish and tilapia, blue-green cyanobacteria spirulina, and insects — transforming them into certified, marketable human food products and feed.

This farm-to-fork approach, reaching Technology Readiness Level 7 (TRL7), leverages climate-smart, sustainable local resources, innovative chilling and drying processes powered by renewable energy, reduced water use and circular economy systems — all managed by a diverse multi-actor consortium of 20 partners across Europe and Africa, working closely with local communities.

The project's communication and dissemination plan outlines all related knowledge management tools, channels, feedback loops and key messages to be shared with diverse audiences and stakeholders. Internally, partners collaborate through regular online and in-person workshops and progress reviews, with access to knowledge outputs and project materials on the virtual ECOHUB platform.

Data and results — gathered using AI sensors and IoT in the ECOHUBs, living labs and partner institutions — are stored securely in the Cloud for partners, then communicated to wider audiences through diverse channels: the project website, targeted social media,

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educational videos, short documentaries, e-learning, leaflets, policy briefs, booklets and media coverage.

Effective knowledge exploitation relies on robust knowledge management protocols. Protecting sensitive data is essential, especially where novel, exploitable solutions for human health and food safety are concerned. All project partners are encouraged to assess the exploitation potential of their results before choosing traditional research publication channels.

If results are to be communicated before (or instead of) exploitation, the project has established a clear process for evaluation. All results are carefully assessed to ensure no exploitable outcomes are lost and no health risks are overlooked. To guide this, the project's Innovation and Intellectual Property Committee (IIPC) and Communication Committee (CC) work alongside WP8 to oversee compliance, ethical dissemination and effective knowledge transfer.

HISTORY OF CHANGES

History of changes		
Version	**Date**	**Changes**
Version 0	**31.05.2024**	
Version 1 (Updated DMP)	**30.06.2025**	

PURPOSE OF THE UPDATED DATA MANAGEMENT PLAN (DMP)

This document updates the Data Management Plan (DMP) originally submitted as Deliverable D8.1. It provides revised strategies for the collection, storage, curation, and sharing of data across the INNOECOFOOD project to reflect progress made and new practices adopted from M1 to M18.

SUMMARY OF UPDATES SINCE D8.1

- **Baseline survey data collection and cleaning completed in 6 countries**

In D8.1: Baseline surveys were planned as a key data source under WP8 to map community needs, aquaculture practices, and local capacities.

In D8.13: The surveys have been fully conducted, cleaned, and organized in standard templates. Socio-economic, gender, and farm-level data from Egypt, Ghana, Kenya, Namibia, Tanzania, and Uganda now feeds into ECOHUB planning, training design, and policy recommendations.

- **Initial training materials, micro-lessons, and ToT modules uploaded to Synology Drive**

In D8.1: It was proposed that training materials would be developed progressively for ToTs and rural communities, but specific content was yet to be produced.
In D8.13: Draft ToT manuals, micro-lesson slide decks, and training videos have now been curated, digitised, and uploaded to the Synology Drive for partners. These materials form the backbone of ECOHUB capacity building for fish, spirulina, and insect value chains.

- **Environmental, safety, and nutritional data generated under WP3–WP7 digitised**

In D8.1: Data on production trials, nutritional profiles, safety testing, and environmental impacts was projected but still in the planning and pilot stage.
In D8.13: Concrete data has now been collected through living labs and lab analyses — covering fish feed trials, spirulina composition, insect processing safety, and LCA impact figures — all digitised for analysis, reporting, and quality assurance under WP7.

- **Metadata tagging and standardization templates implemented project-wide**

In D8.1: A general commitment was made to align data with FAIR principles, but a detailed system for metadata tagging and templates had not been finalized.
In D8.13: Standardized metadata sheets and tags have been rolled out for all WPs. This ensures that files, survey outputs, lab reports, and training resources are findable, searchable, and interoperable across the consortium.

- **AI and IoT sensor data streams are active in ECOHUBs and Living Labs**

In D8.1: The DMP described planned installation of AI and IoT devices for water quality, feed efficiency, and environmental monitoring, but deployment was pending.
In D8.13: Real-time data streams from pH sensors, turbidity meters, and smart feed monitors are now operational in ECOHUBs and living labs. These feed into Maria DB databases for real-time tracking and decision support for eco-farming.

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- **Communication Protocols and media resources (videos, guides) shared across internal and public platforms**

In D8.1: It was proposed to develop communication outputs like videos and factsheets for stakeholder awareness, but none were finalized yet.

In D8.13: Visual tutorials, training videos, farmer guides, and promotional clips have now been produced and shared via Synology, the INNOECOFOOD website, and social media, expanding outreach to farmers, youth, and the wider public.

DATA MANAGEMENT PLAN (DMP) OBJECTIVE

The Data Management Plan outlines strategies for research and other data collection, archiving and management, for the optimization of access to and re-use of all the data and outputs. It will document the policies and procedures for the consortium on how the data will be handled, generated, processed, methods and standards applied, which data will be made openly available and how data will be curated and preserved, with measures to facilitate the interoperability and reuse based on existing open science resources and Horizon Europe guidelines. The DMP will outline the infrastructure's data and knowledge outputs developed for the project. The DMP will be regularly updated, reviewed by the consortium, and revised as needed. Updated versions will be provided at M18 and M36.

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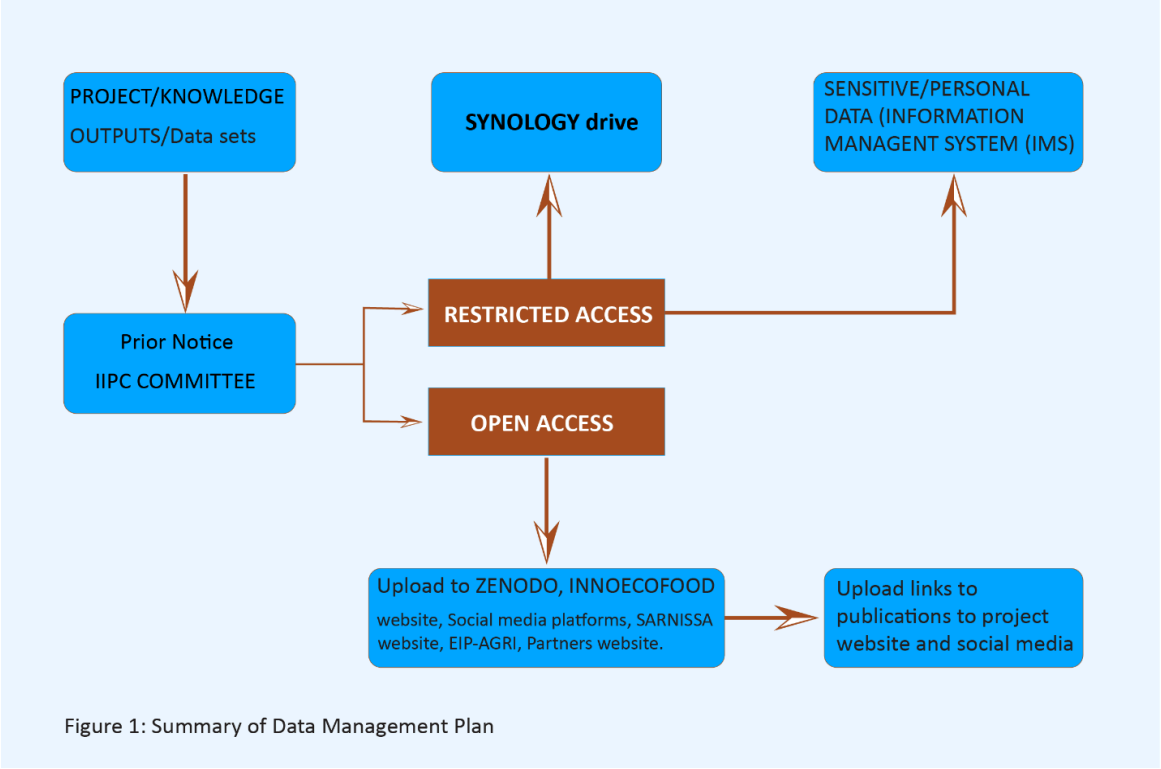

Figure 1: Summary of Data Management Plan

INNOECOFOOD partners involved in publication of open access knowledge outputs should follow a prior notice as outlined in the INNOECOFOOD Innovation and Intellectual Property Committee (IIPC) and Communication Committee (CC) Terms of Reference (ToR).

PRIOR NOTICE SUMMARY

Prior notice of any planned publication shall be given to the other project beneficiaries not less than 45 calendar days in advance of a scientific publication, poster and oral publications / presentations.

- **WP8 – FSPN-A:** will send the information to the consortium, reminding beneficiaries about the prior notice rules. Any objection to the planned publication shall be made in accordance with the Grant Agreement in writing to the author and the coordinator. If no objection has been received before the set date, the author can assume that partners consent to the planned publication.
- **WP8 – FSPN-A:** Now uses a dedicated Synology folder for storing pre-publication drafts for partner review during the 45-day notice period.
- **WP8 – FSPN-A:** An email reminder template is in place to notify all beneficiaries when new publication drafts are uploaded.
- **IIPC chair and committee:** will review the information and carry out the IIPC assessment. The IIPC may request further information from the authors. The IIPC will send all information to the CC, if the

activity does not involve exploitable results.

- **IIPC Committee:** Implements a standardised checklist to assess publications in line with the Grant Agreement and IPR strategy.
- **CC chair and committee**: will review the information and check EC communication activity requirements. Additional information may be requested.
- **CC:** Uses an internal tracker to log all publication notices and monitor the 45-day and 10-day timelines.
- **CC:** Ensure ToTs and consortium teams have been briefed on these procedures during WP8 capacity building to strengthen compliance across ECOHUBs.

Timelines

- WP8 – FSPN-A: Notice to the consortium will be issued immediately. Any objection to the planned dissemination activities must be made in writing to the Coordinator and to the Party or Parties proposing the activity within 45 calendar days after receipt of the notice in the case of publication, oral communication or poster.
- IIPC Assessment period = 10 calendar days (if no further information is requested/required from the author)
- CC Assessment period = 10 calendar days (if no further information is requested/required from the author)

PROJECT DATA SETS

INNOECOFOOD is a multidisciplinary project that requires different types and forms of data sets applied as it fits to meet the project objectives. Depending on the work packages, both primary (surveys, interviews, laboratory data, FGDs) and secondary data (training content development process).

WP2 Data Sets

WP2 is key in establishing living labs and the eco hubs in six countries. WP2 will collect data using AI sensors installed in the living labs and eco hubs to measure specific parameters: Temperature, dissolved oxygen and pH in ponds, dissolved oxygen, water level, turbidity and pH, nutrient levels (ammonia, nitrates and nitrites, phosphorus), fish health (endotoxin levels) to ensure quality of water for fish and biomass of spirulina in the living labs and eco hubs as well as humidity and temperature control for production of fish.

Since D8.1, AI sensors have been installed and are streaming live data on water quality parameters in all six ECOHUBs. Dashboards have been developed to help local operators and partners monitor conditions in real-time.

WP3 Data Sets

The data from WP2 will be used in WP3 (that focus on production of fish, fish feeds and post-harvest technologies in the Ecohubs and cages) to control the parameters to ensure optimum production and growth of fry and fingerlings in 2 fish culture systems, conventional RAS- Recirculation Aquaculture system (Kenya, Ghana) and IPRS- In-Pond Raceway System (Tanzania, Egypt). The results from the two systems will be compared as it relates to water and energy usage in the ECOHUBs and within the living labs to monitor the quality of water, fish health and welfare. Additionally, WP3 will assess and compare the commercial fish feed and the proposed fish feed formulations against the conversion factor, crude protein ratio, and ingestion. Parameters such as growth, length, weight, survival, body composition, and fish welfare will be used to select the best feed.

Data from the two aquaculture systems (RAS and IPRS) is now being compared, with feed trials completed in Kenya and Ghana. Initial water and energy usage data is being validated and shared through Synology for all partners.

WP4 Data Sets

WP4 focuses on optimization of production of the selected spirulina strains and processing of spirulina; 10 strains of spirulina from selected local lakes will undergo molecular analysis. Data from the analysis will be used to characterize each strains based on nutritional and phycocyanin content, and best strain selected for optimal mass production and phycocyanin content. Parameters including temperature, light and dark cycle, pH and salinity and culture media will be measured and optimum growth conditions will be identified for the selected strain.

Data of 10 spirulina strains have been sampled and molecular analyses are underway. Preliminary culture condition data is being stored with complete metadata for future scale-up.

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WP5 Data Sets

In WP 5 (where the focus is optimization of selected insect species production and post-harvest processing) a survey will be conducted in the local markets mapped in WP 8 to map the type of agricultural waste (vegetables, fruits and food) available, amount available and distance of the markets and the production unit. Furthermore, lab analysis of the mapped agricultural waste will be done to identify their chemical, biological and nutritional content (biological instability, potentially pathogenic nature, water content, intrinsic autoxidation, and level of enzymatic activity using standard methods indicated by WP7). The data gathered will help to select feeds for insects as food and feed. Additionally, WP5 will assess nutritional quality properties of insects as food and feed using standard AOAC methods for proximate analysis (moisture, protein, lipids, carbohydrates, fiber). Amino acids, fatty acids, minerals and vitamins will be validated by AAS, HPLC, GC-MS methods provided by WP7. To further assess the performance of the waste feed recipes on optimal growth and production of crickets and black soldier flies, data will be collected on the measuring insects' weight, fecundity, longevity, and hatchability of eggs will be collected to assess the performance.

Market surveys and lab analyses of agricultural waste are ongoing, with draft data sheets on waste characteristics uploaded to Synology. Nutritional tests for insects are being cross-checked with WP7 labs.

WP6 Data Sets

WP6 focuses on adding value to conventional food products and non-conventional food products with high protein fish by-products, spirulina and cricket powder. The nutritional quality and safety of the conventional food products will be assessed in WP7 followed by sensory evaluations to consumer panels which will be conducted by WP6. For non-conventional products, collagen and gelatin, bioactive peptides and fish oil extraction and storage, minerals (e.g. calcium, iron, zinc) from fish bones (powder), Phycocyanin from spirulina will be extracted based on standard methods provided in WP7.

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Prototype processing tests for fish by-products, spirulina extracts, and insect powders have started. Early nutritional quality and storage trial results are being compiled for cross-WP quality validation.

WP7 Data Sets

WP7 (focus is validation of quality, acceptance, LCA and certification of products) will assess microbial and chemical safety (TVC, coliforms and salmonella) in water, fish, spirulina and insects in all ECOHUBS basic QC labs. Coliforms, Listeria, S. aureus, Salmonella, yeast and molds will be enumerated in certified Institutes according to ISO standards. Chemical safety, lipid oxidation markers and volatile base nitrogen and nucleotides will be determined by AOAC methods. They will also assess environmental/processing chemical and biological contaminants, regulated and non-regulated chemical contaminants (e.g. Inorganic As, Cd, Pb, Hg, MeHg, PAHs, PBDEs) and (biological contaminants (e.g. virus and toxins) will be determined using standard reproducible methods. Sensory and acceptability analysis - Data on attributes of products developed in WP3, 4, 5, 6 (color, appearance, flavor, taste, texture and overall acceptability) will be collected through a judgment method applying standard methods.

Qualitative and quantitative research (Key Informant Interviews, observations, semi-structured interviews, focus groups and individual discussions using standard templates) will be conducted. Research findings aided by IoT will help in the effective economic analysis that includes cost-benefit analysis of food products; profitability for sellers and price acceptability for consumers. To assess consumer acceptance, WP7 will conduct public sensory taste testing of fish, insect and spirulina products through administration of short survey questionnaires comprising variables on demographic information (gender, age group, income level, education level); product preference; and barriers that may impact product acceptance. Further, semi-structured interviews with individuals or groups (50% women) who are directly involved in the production, retail or consumption of spirulina and insect products will be conducted by social scientists. Additionally, WP7 will conduct an environmental assessment in the Kenya Eco hub which will act as a model to the other Eco-hubs in 2 phases of data collections; interviews based with Kenya Eco-hub staff and surveys on the site. Data and information collected will be used in

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development of certification programs to be adopted by the other Eco-hubs. WP8 focuses on training youth and women in the Eco-hubs and living labs communicating and disseminating project outputs. WP8 will apply a Geographical Information System to map selected living labs and eco hubs in WP2 and their proximity to markets, schools, stakeholders, other living labs, consumption and production maps in all the six countries. This will be disseminated on the project website. Visual representation of the eco hubs and living labs, to map infrastructures and stakeholders that support activities of the project, market accessibility of the value-added products from the eco hubs.

Basic QC labs have started microbial and chemical safety testing using the agreed SOPs. First-round sensory evaluations for consumer panels are underway in pilot ECOHUBs.

WP8 Data Sets

WP8 will collect qualitative data from a baseline survey and an end-line survey (interviews and Focus Group Discussions) to assess community socio-cultural drivers and demographics for beneficiaries in eco hub areas selected in WP2. Baseline study findings will help in developing a social behavior change communication strategy and refine the project result framework. Training modules will be developed in collaboration with fish, spirulina, insects and agribusiness experts in other WPs to serve as the basis for educational activities on a hosted hybrid Virtual ECOHUB. The modules will be used to train the selected TOTs and later posted in the project's platforms and website for the general public. WP8 will also develop micro lessons for easy learning by the target community as well as 2 educational videos available on the project website and on mobile devices for the general public.

Furthermore, WP8 will shoot short videos/films showcasing products (products developed in WP2-6) development processes and disseminate them to schools to educate them on climate smart technologies.

Baseline survey data collection is complete in all six countries. Initial training modules, micro-lessons, and educational videos have been produced and uploaded for ToT internal review. GIS maps are live with market and stakeholder overlays.

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Data Sets formats and storage

The data collected by sensors will be hosted in one system by INNOTECH and IoT analysis will be stored in MariaDB database which will be accessible to partners and processed data shared in excel readable cvs files and accessed as dashboards and web applications. The quantitative data sets (lab data, field data and survey data) will be stored in excel format which can be analyzed by different statistical software packages as appropriate. Textual files will be stored in MS Word (.doc/.docx) and pdf. The qualitative data such as images, audios, and videos will be stored in PNG, MP3 and MP4 formats. Focus Group Discussions (FGDs) and interview audio recordings will be discarded after verbatim transcription. Videos and audios related to training will be stored and periodically used. All the project datasets will be stored in the project SYNOLOGY DRIVE under labeled work package folders. Knowledge outputs from analysis and interpretation from the datasets generated within the project will be useful to relevant stakeholders such as, education and knowledge institutions, regional, national and local government, aquaculture farmers- youth and women, schools, food industry, public and private providers of funding and support for Agro-ecological innovations and media.

Synology Drive structure has been finalised with clearly labelled folders for each WP. Real-time sensor data is integrated into dashboards. Data naming and metadata standards have been rolled out for consistency.

FAIR PRINCIPLES

INNOECOFOOD will integrate the principles of open science across its partnership, via open cooperative work and systematic sharing of knowledge and tools as early and widely as possible, in accordance with rules and regulations as established in the Horizon Europe and our Grant Agreement, the ethical principles or research, publishers' terms and conditions, and EU legislation. INNOECOFOOD generated and collected data will be open access and 'FAIR', that is Findable, Accessible, Interoperable and Re-usable, unless there are justified reasons for opting-out.

Making Data FINDABLE

INNOECOFOOD partners are expected to deposit their project outputs and publications in an open access repository for the public to boost research credibility and enhance visibility. ZENODO is the selected open access repository where all project outputs will be deposited. Each dataset and accompanying meta-data will be assigned a Digital Object Identifier (DOI), which will be included in publications in ZENODO. Intellectual Property and Communication Committee Terms of references highlights procedures and policies to be followed in the publication process.

WP8 will develop a virtual ECOHUB- a user-friendly platform to disseminate all consolidated information and findings from the technologies and practices adopted in the six Ecohubs, and 4 Living labs and partner countries including scientific reports, publications and outputs in user-friendly form. It will serve as a one stop resource center for project partners, aquaculture actors and other relevant stakeholders to follow up on the activities and success stories in the different project countries to which all may not have access to. To further enhance data findability, project communication and dissemination activities will be made available on the project website.

Making DATA ACCESSIBLE

The consortium will provide open access to knowledge outputs generated within this project to the consortium members and public. Access will be controlled to project beneficiaries' personal and sensitive data. Restricted access data generated by the INNOECOFOOD project is stored in SYNOLOGY drive. Partners will deposit their well labeled data sets and project outputs in SYNOLOGY drive within respective designated folders. Selected data and project outputs will be shared to scientists and other stakeholders through ZENODO, a trusted open access repository. The uploading of the knowledge outputs is the responsibility of partners who own them. Procedure of uploading project outputs in the repository will be included in the next version. To further make the project outputs accessible, they will be disseminated in appropriate languages at national and regional levels through INNOECOFOOD website, partners' websites and SARNISSA website, and regional fisheries organizations to influence policy and attract key stakeholders. All links to project's associated publications will be made

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publicly available in the INNOECOFOOD website INNOECOFOOD and social media platforms highlighted in the communication plan. Monitoring data accessibility is part of the IIPC committee's responsibilities.

Making DATA INTEROPERABLE

Datasets will be measured using standard formats and methodologies provided by WP7 to ensure wider distribution and adoption of the project outputs by other researchers, scientists, organizations and countries. Data will be uploaded in excel format, which is compatible across the main statistical software. Meta-data will be uploaded as excel files, textual documents as MS Word (.doc/.docx) and pdf and images, audios, and videos will be stored in PNG, MP3 and MP4 formats. Protocols on methodologies and standards developed in W7 will be reviewed and approved before publication.

Making DATA RE-USABLE

INNOECOFOOD is expected to produce different types of datasets. The datasets and knowledge outputs will be deposited in SYNOLOGY DRIVE for the consortium and ZENODO an open access repository for the public. No specialized software or tools will be needed to access, download or use the data. Datasets produced in different WPs might be re-used on another WP to achieve their goals and objectives. Scientists will present their results at national, regional and international scientific conferences, seminars, food fairs to scientific and non-scientific communities, policy makers and industry. WP8 together with the project coordinator will organize 2 conferences (M18 in collaboration with JRC and M36) to disseminate project outputs and 2 local market days within the Ecohub and living labs regions to promote fish, spirulina and insects' products.

The resulting innovative knowledge from this project will feed into the EIP-AGRI (The agricultural European Innovation Partnership) website for broad dissemination to practitioners in the form of best practice abstracts. The link to EIP-AGRI website will be available in the project website INNOECOFOOD and social media platforms. At least 3 educational tutorial videos on the three value chains that is insect, spirulina and fish, 1 animation video on project concept and one documentary on benefits to the communities' livelihood will be produced and disseminated to a diverse audience through different media

platforms to provide wider scientific and non-scientific community opportunities to learn about the technology and innovations.

ALLOCATION OF RESOURCES

FSPN-Africa is responsible for data management and the development of the Data Management Plan (DMP). Data management infrastructures will be overseen by both FSPN-Africa and CIIMAR. FSPN-Africa will develop an Information Management System (IMS) designed to store, manage data of the project beneficiaries in the Eco-hubs and living labs. Data management activities have been budgeted for within the project framework.

DATA SECURITY

Qualified researchers will handle the data, adhering to strict confidentiality agreements and ensuring compliance with both national and European data protection and privacy regulations. Designated consortium members selected by partner institutions will have a secure, password-protected access to the SYNOLOGY DRIVE. Prior to publication, results will undergo a review process to ensure intellectual property rights (IPR) protection by the consortium's IPP committee (the review process is well highlighted in the IIPC Terms of Reference). Data collected from sensors at the living labs and ecohubs will be securely uploaded to a centralized cloud (MariaDB), analyzed, and shared via a secure web server. Project beneficiaries' personal data stored in the Information Management systems will have restricted access to designated ECOHUBs and Living Labs coordinated by WP8.

WP8 data officers would be assigned to monitor compliance with confidentiality and data protection rules. Synology Drive and MariaDB now include access logs to track authorised use. The IIPC committee has reviewed initial draft publications to ensure IPR protection is enforced. ECOHUB coordinators should be trained on securely managing personal beneficiary data within the Information Management System (IMS).

ETHICS AND CONFIDENTIALITY

Compliance to ethical consideration as it regards humans, animals and genetic materials in the project will be as per guidelines and policies developed by WP9 led by CIIMAR. This will be complemented by ethical approvals within the respective countries on ethical adherence.

LONG-TERM PRESERVATION ADDITION

Long-term preservation will be ensured through permanent DOIs for datasets deposited in Zenodo and, where applicable, partners' institutional repositories.

RISK & CONTINGENCY ADDITION

A fallback procedure is in place to migrate datasets to alternative trusted repositories in the event of Synology or Zenodo service disruption, ensuring data integrity and continuity for project Partners and stakeholders.