



Smarter livEstock Breeding through Advanced Services Tailoring Innovative and multi-sourceE data to users' Needs

Fourth Semester Activity Report

July – December 2023

European Commission Health and Digital Executive Agency (HaDEA) Connecting Europe Facility	Interim report
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1. INFORMATION ON THE ACTION	
Grant Agreement N°	INEA/CEF/ICT/A2020/2373580
Action Title (Art. 1 of G.A.)	SEBASTIEN
Action number (Art. 1 of the G.A.)	2020-IT-IA-0234

Author of the report	
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2. IMPLEMENTATION OF THE ACTION¹

2.1. Overall completion of the Action

Planned Start/End date ²		Actual Start/End date		Completion ³
Jan 2022	Jun 2024	Jan 2022	Jun 2024	70%

2.2. Completion per activity/work package

Activity 1	Title ⁴	Planned Start/End date ³		Actual Start/End date		Completion
	Project Coordination and Management	M1	M30	M1	M30	65%
Milestone no	Title ³	Planned date ³		Actual date		Reached (Y/N)
2	Progress report no. 4	M24		M24		Y

Activity 2	Title ³	Planned Start/End date ³		Actual Start/End date		Completion
	Outlining geospatial to livestock data gathering, processing and integration steps	M1	M18	M1	M21	100%
Milestone no	Title ³	Planned date ³		Actual date		Reached (Y/N)
4	Report on data synthesis	M18		M21		Y

¹ For Interim report: please describe the completion of the action until the end of the reporting period as specified in the Grant Agreement.

² As specified in Art. 2.2 of the Grant Agreement.

³ The completion of the Action and of each activity/work package should be indicated as a percentage.

⁴ As specified in the Grant Agreement

Activity 3	Title ³	Planned Start/End date ³		Actual Start/End date		Completion
	Data platform for livestock management	M6	M27	M6	M27	65%
Milestone no	Title ³	Planned date ³		Actual date		Reached (Y/N)
6	Data access layer has been released	M21		M24		Y

Activity 4	Title ³	Planned Start/End date ³		Actual Start/End date		Completion
	Stakeholders' involvement: from co- design to co- evaluation	M1	M30	M1	M30	65%
Milestone no	Title ³	Planned date ³		Actual date		Reached (Y/N)
9	Scientific report on final indicators	M22		M22		Y
10	Report on services evaluation	M24		To be defined		N

Activity 5	Title ³	Planned Start/End date ³		Actual Start/End date		Completion
	Outreach and sustainability	M1	M30	M1	M30	80%
Milestone no	Title ³	Planned date ³		Actual date		Reached (Y/N)
No milestones expected						

Activity 6	Title ³	Planned Start/End date ³		Actual Start/End date		Completion
	Open Data and Services Exploitation Portal for the livestock sector	M1	M30	M1	M30	70%
Milestone no	Title ³	Planned date ³		Actual date		Reached (Y/N)
15	First release of the service portal	M21		M21		Y

2.3. Description of the implementation of the Action, including the actual status at the end of the Action (or of the reporting period) and possible deviations from the planned activities, and, if applicable, compliance with any relevant specific provisions as indicated in the Annex I of the GA

Activity 1 - Project coordination and management

Task 1.1: *Management of the Action (M1-M30)*

Task 1.2: *Financial Management (M1-M30)*

Description of activities

Main outputs achieved (as per GA and milestones):

- Fourth progress report

The following activities have been performed:

- Planning and coordination of monthly Activity Leaders meetings
- Planning and organization of periodic Project Management Board meetings
- Coordination and management of technical and scientific activities, particularly focusing on the deviations related mainly to Activities 2, 3, 4 and 6
- Monitoring of financial aspects of the Action, with particular focus on the delays regarding Equipment expenditure in Activity 2

Activity deviations:

- None

Milestones:

- no. 2 - Progress report

Deliverables:

- None

Lead partner: CMCC

Other contributing partners: All

Activity 2 - Outlining geospatial to livestock data gathering, processing and integration steps

Task 2.1: Review and pre-selection of indicators/indices (M1-M3)

Task 2.2: Identify existing data sources and ways for access and extraction (M4-M9)

Task 2.3: Designing of new project-customized variables (M1-M6)

Task 2.4: Planning data elaboration and integration steps (M7-M18)

Description of activities

Main outputs achieved (as per GA and milestones):

- Report on the data synthesis methodologies shared with the Agency

The following activities have been performed:

- Active participation in the definition of the final services' products. Interaction with other Activities (3, 4 and 6) to develop the four services envisaged in Activity 6
- Finalization of ML prediction models for the four services
- Integration of the ML models included in the SEBASTIEN data platform
- Final testing of IoT sensors data collection

Activity deviations:

The delay in data provisioning documented in the previous reporting period, needed for the development of services 3 and 4, delayed the development of the first version of the prediction models by 3 months. This has consequently delayed the delivery of Milestone 4 and the subsequent phases of the project, which depended on them. About the IoT sensors (animals and environment), in addition to the delays in the electronic components' supply chain that prevented the large-scale production during the previous semester, we experienced an additional delay due to unexpected causes.

First, the large-scale construction of animal sensors was further delayed due to the provision of incorrect components. Components for LORA transmission using the U.S. radio frequency were supplied instead of the ones compliant with Italian standards. This delayed the animal sensors' construction.

Second, the developed ear tags have been considered not suitable because the collection of acceleration components, animal temperature, heart ratio and blood oxygenation data was not stable. For this reason, a collar version of the IoT animal sensor was created. However, it was not possible to identify suitable boxes on the market and an in-house production was started, using a 3D printer. However, only 1 box per business day is produced. For this reason, at the end of this semester, only few boxes (20) were produced and only few IoT animal sensors were tested in the field. The complete set of IoT animal sensors is expected to be on the field collecting data only in the first quarter of 2024.

Milestones:

- no. 4 - Report on data synthesis

Deliverables:

- None

Lead partner: UNITUS

Other contributing partners: AIA, UCSC, CMCC, NATURE4.0, CINECA



Activity 3 - Data platform for livestock management

Task 3.1: *Livestock sector and environmental data gathering (M6-M15)*

Task 3.2: *Data access layer (M10-M21)*

Task 3.3: *Database of environmental, vegetation and physiological conditions' indicators/indices (M13- M27)*

Description of activities

Main outputs achieved (as per GA and milestones):

- Report on Data Access Layer is shared with the Agency

In addition, the following activities have been performed:

- Implementation of a beta version of the Data Lake drivers related to IoT and Sentinel data
- Implementation of the pipeline for Service 3 indicators computation
- Implementation of a standard OGC API (Map & Feature), in particular Web Map Service and Web Coverage Service
- Deployment of the Data Access Layer API and integration with the Data Lake

Activity deviations:

The due date of Milestone 6 has been moved from September 2023 to December 2023. This was due to the delay related to the services specifications and requirements, and to a delay in the IoT sensors deployment. Specifically, the implementation of the OGC API standard was required for maps production along with geojson features needed for different services; in addition, the implementation of the Data Lake driver and the API for the IoT streams was also necessary. The API will be tested in the next months during the implementation and finalization of the Services and the Data Portal. During the testing, it could be necessary to review the API, which can require further effort for the finalization of the Data Access Layer.

Milestones:

- no. 6 - Data access layer has been released

Deliverables:

- None

Lead partner: CMCC

Other contributing partners: CINECA, NATURE4.0, UCSC, UNITUS, AIA



Activity 4 - Stakeholders involvement: from co-design to co-evaluation

Task 4.1: *Stakeholders' engagement (M1-M30)*

Task 4.2: *Tailoring data, indicators and tools (M7-M23)*

Task 4.3: *Evaluating the services with stakeholders (M19-M30)*

Description of activities

Main outputs achieved (as per GA and milestones):

- Brief report containing the catalogue of final indicators/indices is shared with the Agency

The following activities have been performed:

- Planning, organization, implementation, and coordination of two meetings to collect feedback from stakeholders

The first meeting was organised during "Fiera Agricola Zootecnica Italiana" (Agriculture and Livestock exhibition). The event, which took place in Montichiari, Brescia, Italy on October 28, 2023, saw the participation of twenty people: farmers, breeders, and representatives of breeder associations. The second meeting was held at AGRIS research center located in Monastir, Cagliari, Italy on the 13th of December 2023. The updated status of Sebastien Services was presented to AGRIS personnel (Sebastien stakeholder). Service 4, focusing on the prediction of blue tongue disease spread in the Sardinian region, where AGRIS operates, received special attention. All feedback collected during the two meetings was recorded and will be included in the dedicated milestone (10).

Activity deviations:

Due to the cumulative delays in associated activities, presenting a functional version of the web and App front-end to stakeholders has not yet been feasible. Consequently, an extension by a few months would enable stakeholders to assess the implemented services as presented on the website and dedicated App, allowing them to provide their final remarks.

Milestones:

- no. 9 - Scientific report on final indicators

Deliverables:

- None

Lead partner: UCSC

Other contributing partners: UNITUS, CMCC, AIA



Activity 5 - Outreach and sustainability

Task 5.1: *Communication and Dissemination (M1-M30)*

Task 5.2: *Lessons learned: toward services sustainability and upscaling (M19-M30)*

Description of activities

Main outputs achieved (as per GA and milestones):

- No main outputs expected for the fourth semester

In addition, the following activities have been performed:

- 6th Outreach team meeting held online on September 20th
- In collaboration with Activity 4, organization with CMCC, AIA and UCSC of a face-to-face event with stakeholders, held on October 28th in Montichiari (BS) during FAZI 2023
- Graphic preparation of dissemination materials for distribution at events (roll-up poster, flyers, gadgets)
- Creation of news accounting for progress within the project, including workshop/congress/etc. participation, and dissemination on the project's social channels
- Several meetings with CMCC and NEATEC to discuss modifications and improvements to the project website (e.g., new sections and updates, different tables with milestones, deliverables, publications, and conference presentations, etc.)
- Review and update of the event GANTT
- Supplies collection for M12

It is worth noting that the SEBASTIEN project video teaser was submitted by CINECA to the Suzanne Awards Film Festival, held in Amsterdam on October 26th to 28th, which has been honoring the best animation work created with Blender since 2003. There were three categories: animation, design and short film and the video competed for all of them. Concerning Task 5.2, a questionnaire was drafted, to be then finalized and circulated among partners, to collect information about which algorithms, datasets, and/or related further elaborations will continue to be developed internally, i.e., within the partnership, which require additional funds or externalization, or for which results will be made available without follow-up. Moreover, information about foreseen licenses, new opportunities of fundings and needs for agreement will be identified.

Activity deviations:

- None

Milestones:

- None

Deliverables:

- None

Lead partner: UNITUS

Other contributing partners: All

Activity 6 - Open Data and Services Exploitation Portal for the livestock sector

Task 6.1: *Open Data Policy (M1-M12)*

Task 6.2: *Open Data Catalogue (M1-M30)*

Task 6.3: *Open Data and Services Exploitation Portal (M13-M27)*

Task 6.4: *Visualization and dissemination tools (M13-M27)*

Description of activities

Main outputs achieved (as per GA and milestones):

- Milestone 15: First release of the portal with limited functionalities publicly accessible; link shared with the Agency
- Deliverable 6.2: Document describing Portal's architecture

In addition, the following activities have been performed:

- Periodic meetings for functional analysis, definition of services and recognition of the datasets necessary for the services organized by CINECA with the participation of CMCC, UNITUS, AIA, UCSC and NEATEC.
- The development of the front-end module for services and the integration of the Data Lake APIs into the Services Portal continues. The Service 2a (Intensive farming risk management under climate extremes - Evaluation of the THI inside stables) is complete and functioning on the development and production Portals. User stable management is implemented.
- The Open Data and Services Exploitation Portal is available and accessible at the URL: <https://dds.sebastien-project.eu>. This version will be further enriched as soon as new developments of the services will be available.
- A first version of the mobile SEBASTIEN app is available. In detail, the interface that invokes the Service 2a was implemented and its integration with Data Lake APIs was tested.
- Regarding the analysis of the IoT data visualization service from animal sensors, the mockup and the design of the animal sensor data dashboard are defined.
- Coordination activities for the different services have been carried out. In particular, a document has been shared with all partners to track the completion status of the various elements that make up the implementation of the services.

Activity deviations:

The delay in completing the development of the Services is due to the delay in the availability of data and the consequent delay in the development of the first version of the forecasting models that the Sebastien services are based on.

For this reason, Milestone 16 "Final release of the service portal" and Deliverable 6.3 "Interactive multi-dimension visualization & dissemination tools" should be postponed by a few months to complete the development of all service functionalities.

Milestones:

- no. 15: First release of the service portal

Deliverables:

- no. 6.2: Document describing Portal's architecture (postponed from Apr. to Sept.)
- no. 6.3: Interactive multi-dimension visualization & dissemination tools (postponed)

Lead partner: CINECA

Other contributing partners: CMCC, UNITUS, AIA, UCSC, NATURE4.0, NEATEC

2.4. Conclusions on results of the Action, including the impact of the possible deviation on 1) the objectives of the action, 2) the completion of the planned activities and 3) the cost-breakdown

The Action has been experiencing some delay concerning Activities 2, 3, 4 and 6.

Specifically, the completion of Activity 2 has been delayed by 3 months due to the unavailability of data which consequently slowed down the implementation of the prediction models. Moreover, the IoT sensors experienced an additional delay due to an incorrect protocol transmission and the unreliable data collection of some animal parameters detected using the ear tags.

The above-mentioned unavailability of data caused a knock-on effect on the definition of the services, thus impacting Activities 3, 4 and 6. Specifically, there have been delays in the development of the API layer, the development of the service portal and the related mobile App. For this reason, regarding Activity 4, Milestone 4 has not been achieved yet, as no comprehensive services evaluation by the stakeholders could be performed. More details about the status and the delays of the activities have been reported in the Activities description (see section 2.3).

These delays also affected the allocation of resources, causing a shift in staff allocation that has already been planned for the next months.

The SEBASTIEN Project Management Board convened several times in recent months, and it was deemed that these delays would result in the Action being closed with an unsatisfactory result in terms of output quality compared to the established benchmarks, although some mitigation measures were put in place during the reporting period. For this reason, the extension of the Action was suggested, and the request will be submitted to the Project Officer in the next weeks.

The delays in the various Activities are expected to impact the date of completion of the Action. No impacts are expected on the objectives of the Action and on the cost breakdown.

3. VISIBILITY OF UNION FUNDING

What measures have been taken to publicize the Action, including EU funding (GA II.7.1)?

During the fourth semester, the SEBASTIEN project was promoted by partners at the following events:

- Portici (NA), 13th to 15th September, at the 27th Workshop on the Developments in the Italian PhD Research on Food Science Technology and Biotechnology: poster entitled "Development of strategies for the adaptation of the livestock sector to the new climate regime with machine learning and artificial intelligence method" (Chiara Evangelista - UNITUS)
- 29th September, European Researchers' Night 2023, both in Lecce (poster disseminating the project - CMCC) and Bologna (projection of video teaser - CINECA)
- Montichiari Exhibition Centre (BS), on October 28th, during the 96th Italian Zootechnical Agricultural Fair - FAZI 2023: face-to-face event with stakeholders and citizens
- AGRIS experimental farm for sheep farming, Monastir (CA), on December 13th: face-to-face event with stakeholders with a special focus on Service 4 about the blue tongue disease



4. OTHER SOURCES OF EUROPEAN UNION FUNDS

If applicable, provide information about other sources of EU funds (CEF, ERDF, Cohesion Fund, H2020, TEN, EEPR, EIPA, etc.) used for the action (including previous or subsequent phases not covered by the Grant Agreement).

Not applicable.

5. COMPLIANCE WITH EU LEGISLATION

Where relevant, provide information on the compliance with EU legislation regarding other matters (notably public procurement, competition, regulatory matters, etc.).

During the fourth semester, there haven't been any relevant compliance matters to report.

6. COMPLIANCE WITH CORE PLATFORM AND POLICY OBJECTIVES

Information on the compliance with the core service, including conformity with relevant technical specifications and alignment with the policy objectives of the Digital Service Infrastructure (as specified in the relevant CEF Telecom Work Programme).

No activities related to compliance have been carried out yet.