LIFE Project Number

LIFE15 ENV/GR/000257

Mid-term Report

Covering the project activities from 01/09/2016[1] to 31/01/2019

Reporting Date[2]

28/02/2019

LIFE PROJECT NAME or Acronym

LIFE-F4F (Food for Feed)

Data Project

Project location:	Heraklion, Crete
Project start date:	01/09/2016
Project end date:	28/02/2020
Total budget:	€ 2,580,619
EU contribution:	€ 1,459,227
(%) of eligible costs:	60%

Data Beneficiary

Name Beneficiary:	Eniaios Syndesmos Diaxeirishs Aporrimmaton Kritis (United Association of Solid Waste Management in Crete) (ESDAK)
Contact person:	Mrs Paraskevi Panteli
Postal address:	Archiepiskopou Makariou 22, 71202, Heraklion, Greece
Telephone:	+30 2810 361615
E-mail:	esdak@otenet.gr
Project Website:	https://life-f4f.gr/

[1] Project start date

[2] Include the reporting date as foreseen in part C2 of Annex II of the Grant Agreement

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2. List of key-words and abbreviations

ESDAK: Eniaios Syndesmos Diaheirishs Aporrimmaton Kritis (United Association of Solid Waste Management in Crete)
AUA: Agricultural University of Athens
FUB: Freie Universität Berlin
HUA: Harokopio University of Athens
TEIC: Technological Educational Institute of Crete
EC: European Commission
PM: Project Manager
PMB: Project Management Board
PMT: Project Management Team
AB: Advisory Board
TMa: Task Managers
TMe: Team Members

3. Executive Summary

The project LIFE15 ENV/GR/257 is a demonstration project aiming to evaluate, through a pilot scale realisation, an innovative, simple technology and low emissions process that allows the safe transformation of source separated food wastes, mainly from hotels (and generally from the hospitality industry and restaurants), into animal feed, utilising an altered solar drying process.

This is the second technical report (mid-term report) of the LIFE-F4F project covering the period from 01/09/2016 (Start Date) until 31/01/2019 (Month 28). The financial part of this report covers all documented expenses incurred during the reporting period. During these twenty eight months of the project's progress, all preparatory actions have been taken place by all partners, in order to proceed with the core of the project, the construction and the operation of the pilot unit. All partners have closely worked together, following the instructions of the coordinating beneficiary, with the aim to prepare project's deliverables.

According to the project's proposal the main project objectives are the following:

1. Determining in pilot scale, the quality of the animal feed produced in relation to both the wastes source separation system existing and operating in hotels (and secondarily in restaurants), and the suggested innovative drying/pasteurising methodology, based on the solar drying technology.
2. Determining the various technical aspects of the suggested process, the main components of which are: a) non-invasive, refrigerated, separate collection, b) hand sorting / removal of non-food wastes, c) grinding, d) solar drying / pasteurizing of the mixed food, and e) mixing with other animal feed (eg corn) for achieving high quality standards.
3. Evaluating the economical, marketing and environmental parameters related to the process and product (from the source to the shelf). Commercial viability of full scale units, including the customers/end users approach towards the new feed, will be assessed. Part of the environmental evaluation will be the determination of the avoided carbon footprint of food waste converted to animal feed.
4. Developing appropriate scaling up, dissemination, replicability and transferability processes, towards full scale unit(s).
5. Evaluating the policy parameters related to the process, such is the potential role in waste minimization and reuse of non-recyclable wastes (part of an integrated solid wastes management scheme), as well as the Roadmap to a Resources – Efficient EU.
6. Evaluating the inclusion of the F4F product as an ingredient in pet, pigs & poultry food with regard to feed hygiene, feed acceptance, nutrient digestibility, animal welfare and public acceptance
7. Determining its optimum inclusion level for nutritional and economic reasons.

Concerning the covering period of the project, a list of about 28 selected hotels has been created by partners and hotels operational characteristics have been recorded with the use of an electronic questionnaire. The optimum collection routes among these hotels have also been completed and the food wastes collection cost estimation system has also been concluded, during the initial operational period. Among these hotels, four (4) of them

have been selected by partners for cooperation with the project and relevant cooperation agreements have been signed. Qualitative and quantitative analysis of hotels' source separating food wastes scheme has also been completed during the reporting period.

Moreover, during this reference period, exemptions from licensing procedures for the development of the pilot unit and the construction have been concluded on June, 2017. The construction of the pilot unit was concluded on May, 2018 and the official start up of the operation was mainly on July, 2018. However, collection of food wastes from cooperative with the project hotels started on May, 2018. For this period, from May till the first days of July, this collected quantity was pre-treated into the prefabricated building, as the solar drying halls were not completed yet (the construction of the pilot unit which includes the pre-treatment building with all required equipment and the solar drying unit – greenhouse had been concluded at the end of May, 2018, however, the completion of the solar drying halls with the turners concluded at the end of June, 2018). The official pilot unit acceptance by ESDAK from the contractor was held on July, 2018. The initial operational period of the project has been concluded and covered the period from July, 2018 until October, 2018.

Additional are the sources of the main delays in the project's progress occurred during the reporting period. These main delays occurred during the exemption from licensing procedures (5 months delay) the implementation of the new legislation on tendering procedure which had as a result a delay on tendering procedure (started with 8 months delay) and consequently on the construction of the pilot unit an additional 2 month delay from the foreseen end date of the construction due to weather conditions, as intense winds didn't allow the construction of the greenhouse because polycarbonate sheets for the cover of the greenhouse was impossible to be settled down. Moreover, during the construction of the unit extra unforeseen optimizations carried out so as the unit to better meet the needs of the project. In total, from all these issues, a 12 month delay occurred in the project's progress.

However, the first evaluation of the produced product, in combination with the hotels existing separation system and the innovative drying/pasteurising methodology, have been concluded at the end of the first operational period (October, 2018) and the results and all data produced during this initiating operational period are included in this report.

Due to all the delays that have been occurred during the project's progress, the complete chemical analysis of the produced feed, through the pigs and poultry husbandry and pet food industry perspective are expected with a year delay of the project's initial timetable, as also the complete evaluation of the produced feed, in each case. Moreover, the first evaluation of performance indicators and the assessment of the initial situation have also been delayed according to the foreseen timetable, as the initial operation period of the unit had to be concluded. During the reference period all partners have taken all measures concerning dissemination actions, mainly by participating in informative events, open days, conferences, etc. All dissemination actions are uploaded to the project's web-site (https://life-f4f.gr/).

The project's objectives as well as the work plan can still be viable in case of approval of the submitted extension request of the project. During the project's progress partners did their best to face all the delays occurred, however these delays had as a result the completion of project's deliverables also to be delayed at about 12 months, even though partners have followed all the individual activities needed.

The project progress and the delays occurred during the reference period in more details have as follow:

1. A 5 month delay occurred during exception from licensing procedure. The main reason of delays was the exemption from licensing procedures. All licenses had to be approved according to the proposal until February, 2017 and this procedure finally has been routed at the first days of July, 2017. Exemption from three licenses were required for the construction and operation of the F4F pilot unit by Greek authorities, even though the selected area for the construction of the projects' pilot unit had all relevant licenses for waste management procedures. The environmental, the building and the operational licenses' procedures for the approval or exemption are presented in the Tables 3, 4 and 5 in paragraph 6.1.2. of the present report. Certain delays occurred due to bureaucracy and the delay on licensing procedures was about 5 months.
2. One other main delay in the project's progress was the change of tender legislation in Greece (N. 4412, 08-08-16) and the development of new tender models relevant to this new legislation by the respective ministry. This had as a result a delay in ESDAK's tendering procedures and thereafter, in the construction and operation of the pilot unit. This was a delay of about two (2) months for the publication of the first tender.
3. Tendering procedure concerning ESDAK's external assistance support. Despite the legislation change, ESDAK, on November 2016 was among the first public authorities in Greece used this law for the publication of the tender concerning external assistance support in various actions activities, such as licensing procedure. The fact that this new legislation hadn't, until then, been implemented by any other public Greek authority caused a delay in this tender. It should be mentioned that at least 6-9 months were required for the relevant ministry guidelines to be published. The whole tendering procedure was implemented with a 3 month delay for the project and is presenting in Table 12 in paragraph 6.1.7. of the present report.
4. Tendering procedure for the construction of the pilot unit. The change in tender legislation also affected the public tender concerning the pilot unit construction. The tendering procedure for the construction of the pilot unit had to start on October, 2016 and to be concluded on January, 2017. However, this tendering procedure started on June, 2017 and finally concluded on February, 2018. This is an 8 month delay on start up of the tendering procedure and a 13th month delay for the completion of this tender. This delay was mainly related to the delay of the exemption from licensing of the selected area, as it was not possible to be published if the area for the installation of the pilot unit was not legally approved by the relevant public services. Immediately after the licensing permission approvals/ exemptions for the construction of the pilot unit, ESDAK made the first step for this tender, which was the primary request to the Financial Service of ESDAK for the procurement of equipment and materials for the pilot unit and construction of the infrastructure in the framework of the project life F4F (Protocol No 1098/26-6-2017). All this bureaucracy procedure for the public tendering conduction and the needed studies development concluded with the Contract signing (Protocol No 292/8-2-2017), within 7 months. More details concerning the tendering procedure of this tender are presented in the Table 6 in paragraph 6.1.2. of the present report.
5. Tendering procedure for the service concerning collection of the MSW from hotels and the pilot unit operation. The change in the tender legislation also affects the public tender concerning the tender for the food waste collection system. However, the first step for this tender carried out by ESDAK at 1st of February, 2017 with the primary request to the Financial Service of ESDAK for service provision «Services for the collection and transportation of organic fraction of municipal solid waste and the operation of pilot unit in the framework of the project life F4F » (Protocol No 207/1-2-

2017). This public tender has been concluded on January, 2018 (contract signing, Protocol No 11/5-01-2018) with a delay of 6 months, taking into account that for Action B1 the collection system had to be operated on July, 2017. More details concerning this tender are presented in Table 10 in paragraph 6.1.3. of the present report.

6. The construction of the pilot unit. The contractor signed the relevant contract during February, 2018. Even thought the duration of this contract was for 45 days, which was at the end of March, the contractor after extension of the relevant contract, delivered to ESDAK the pilot unit at the end of May, 2018 and the start up of 1st initial operational period for the project was on June, 2018, leading to a 2-month delay due to weather conditions, as intense winds didn't allow the construction of the greenhouse because polycarbonate sheets for the cover of the greenhouse was impossible to be settled down. Moreover, during the construction of the unit extra unforeseen optimizations carried out so as the unit to better meet the needs of the project.
7. The construction of the turners and the solar drying halls, into the solar drying unit. Until the official licensing approval by legal authorities for the construction of the pilot unit, partners from TEIC had made no actions for the publication of the relevant tender for the construction of the turners and the drying halls. However, all required data for this action had been collected by the personnel of TEIC from the beginning of the project. In total, three tenders were published. One for consumables, one for equipment and one for external assistance. Tendering procedure actions for the turners construction started by TEIC on September, 2017. The procedure for consumable tenders concluded on December, 2017 and on March 2018, for equipment and external assistance. These tendering procedures were coincided with TEIC official elections vote for Rector and Vice Rectors, which are being carried out every four years. On November 2017 the official elections vote for Rector and Vice Rectors in TEIC were carried out. During this election period, the new Rector and the Vice Rectors were elected under a new legal framework for the first time (Law 4485 FEK No.114 _ 04/08/2017). After the conclusion of the elections, the new elected Rector and the Vice-Rectors have been officially authorized (FEK No. 663 _ 30/11/2017). However, the assignments of responsibilities of Vice rectors were officially authorized by TEIC on February, 2018 to be able to perform their duties in the Institute (FEK No. 203_30/01/2018). The assignments of the official document couldn't be signed until the new vice rectors to be officially declared as the main representative of the Institute. This procedure lasted for about three months. This delay affects the tendering procedures, causing a corresponding 3-month delay. The solar drying turners were foreseen to be delivered on June, 2017 and finally were delivered with a twelve month delay, on June 2018. Details about these three contacts are presented in Tables 7, 8 and 9 in paragraph 6.1.2. of the present report.

Due to all the delays occurred so far in the project's progress it is anticipated that partners will be able to run the full scale operation and the optimum operational period of the project (foreseen to last 6 months for each of the 2 remaining periods, from May till October each period), in case of the project's extension amendment request approval. The fact that partners finally succeeded in overcomimg all the difficulties that occurred during this period and after the conclusion of the pilot unit construction, the project objectives, the key deliverables and the outputs can still be viable in case of the approval of the submitted extension request. The key issue at this point is the project's approval extension, so as partners to have the opportunity to move on with the main core of the project. The timetable will expand for twelve (12) more months in comparison with the

approved project's timetable. In this case, the overall project's objectives will not be affected.

Until now, no significant technical changes have been encountered and it seems that it's not likely to occur until the end of the project. For the reporting period the project is within budget and there is an effective coordination and communication among project's partners. At the moment, according to the updated timetable, the time schedule of the project is up to 55%, as delays of about 12 months have been occurred in the project implementation. More details about the budget spend by partners during this reporting period is presented in paragraph 8.1. Summary of Costs Incurred, on Table 19. Project's costs incurred.

4. Introduction

In the paragraphs below are presented the description of the project's background, problems and objectives:

1. **The environmental problems / issues addressed through the project are the following, in brief**:
   - Increased consumption of resources for meat and other animal products, necessary for human nutrition
   - Food wastes ending up in landfill.
   - Greenhouse gases' emissions related to producing, transporting, collecting, disposing and landfilling food and food wastes.
   - Reduced wastes' prevention actions.
   - Reduced source separation and separate collection of wastes activities.
   - Need for recycling and reusing of food wastes.
2. **The main hypothesis of the project that has to be demonstrated / verified is the following:** the collection system, the pre-treatment and the applied innovative solar drying procedure of the project can lead to a safe transformation of source separated food wastes (mainly from hospitality industry – hotels and restaurants) into animal feed. It's a recycling and reuse process, since food wastes are reused to produce again food. The process suggested is not considered as a wastes management process but as a feed producing one.
3. **The technical / methodological solution which has been proposed in the project has as follows:**
   - Design, operation and evaluation of a separated collection scheme, for hotels' food wastes in a touristic area of Crete (Greece), taking advantage of the source separating system applied, due to ISO and HACCP regulations.
   - Design, construction, operation and evaluation of a hand sorting, grinding and automated solar drying / pasteurizing process that will allow the transformation of the incoming food wastes into animal feed, within the touristic period. The target of the incoming food wastes per period is anticipated to 150-200tn, to produce an estimated 40 to 50 tn of animal feed.
   - Quality evaluation of the produced feed, determination of its commercial value, the possible need for further processing / mixing and the customer acceptability.
   - Evaluation of the environmental, marketing and economic aspects of the process in a real / full size application, through a series of environmental (focusing on carbon footprint and LCA) and techno-economical evaluations and operation scenarios, utilizing data from all the above aspects of the process, including relevant scale up

and designs manuals and customer's surveys. These actions include efforts to support the replicability and transferability of the process.
- Evaluation of the potential role of such a system in EU policies, such as the waste management and resources efficiency. Provision of needed tools for such an evaluation.
- Dissemination activities.

4. **The project's expected results and the environmental benefits are the following:**
   - An implementation of a source separated food wastes collection system, that does not affect the quality of the collected food wastes, especially in relation to the presence of NON food wastes and the capability of hand sorting to remove them (mainly by avoiding compression). During F4F, the main aim is to collect 150 to 200 tn of food wastes per touristic period (April – October), between May and October (operational period). It is anticipated that 2.5 to 3.0 tn of food wastes will produce 1.0 tn of feed.
   - A hand sorting, grinding and solar drying / pasteurizing pilot unit, able to produce at least 40-50 tn / annum, of acceptable quality feed, which includes both physiochemical characteristics, as well as, biological (absence / significant suppression of pathogenic microorganism), determined by the relevant legal standards.
   - A detailed feed production manual based on the operational data of the pilot unit and the extended evaluation of the end product. It will be the link between incoming food wastes and produced feed.
   - A series of manuals such as design, constructing, business and marketing plan, that would provide all the technical, operational and economical details of how and under which circumstances, this process should be developed into a viable, full scale unit. These manuals will be the main tools for the replicability and transferability of the process.
   - The environmental performance of the F4F process will be assessed. The environmental footprint of the transformation of source separated food wastes into animal feed, utilising an altered solar drying process will be evaluated against the ordinary production of animal feed. A Social-LCA will be implemented in an effort to determine the social and economic impact of the process, to the relevant stakeholders (i.e. animal feed production industry, employees, animal production, etc.)
   - Participation in the policy discussion in relation to EU waste legislation, the policies of Circular Economy and resource efficient Europe roadmap.
   - Thorough dissemination of all the various aspects in relevant key players, the general public and the academia.

<u>In the paragraphs below the expected long term results of the project are being presented in brief:</u>

- From September 2016, AUA, has reviewed and collected all the relative GR and EU legislation and discussions concerning the use of the potential "product" which come out of this project. Thus, the relative to the project legislation is the following: 2009R_1069, 14211 and European Commission, Brussels, 2/12/2015, COM(2015) 0614 final, European Commission, Brussels, ANNEX, 26/1/2017, COM(2017) 33 final, Food and Agriculture Organization 2014. From this legislation it is clear that the potential "product" which will come out of this project, it is forbidden to be used as feedstuff in the production animals and pets but can be used in the diets of furry and animals living in zoos. Furry animals or animals living in zoos?

- Moreover, in the EU a lot of discussions (Definitional framework of food loss and waste as well as non-food parts as livestock feed, FAO, Rome, Italy. Retrieved on 17 December from http://www.fao.org/save-food/news-andmultimedia/events/detail/fr/c/325893/) have been taken place about the food loss and waste which is gaining importance, both in the public and private sectors of the global food systems. The reduction of food loss and waste is very important not only for environmental point of view but also for better resources' efficiency. Many initiatives are being undertaken world-wide to reduce food loss and waste. Thus, one of the main goals of this project will be its contribution to the implementation, updating and development of European Union legislation, concerning the dietary inclusion of potential "product" which comes out of this project in monogastric animals and pets.
- During and also after the end of the project, all actions will be focused in proceeding to a full scale unit, by utilising the investing interest of people or organisations, including those participate in the project. There are different options about how this progress to a full scale unit will take place and who and how will be involved:
    - F4F project partners actively involved in the day after consortium
    - Partners select an outside entity to take over the day after realisation
    - Units developed outside the F4F partners' pilot unit.

It must be made clear that in order all these actions to be successful require considerable work during the project, such as a series of techno-economic studies, business plans, design and scale up manuals, marketing plans, etc, aiming to facilitate this step forward, as foreseen in Action B6. Extensive dissemination activities will allow key players to become familiar with the overall process and the demonstration unit (though mainly open day events), together with experts in such process that will be involved as subcontractors.

Achieving the above mentioned targets, meaning upgrading the pilot unit into a full scale unit, and supporting the development of similar units in other areas and regions, the following actions will take place after the end of the project:

- Direct contact with specific investors in the area
- Direct contact with specific investors in the country
- Direct contacts with investors outside Greece
- Maintaining and operating the pilot unit in a level of demonstrative capability
- Continue feeding trials
- Continue contacts with the academic / research community
- Continue updating the projects web site, Twitter and Facebook accounts
- Continue Networking efforts

Based on the description of the aforementioned actions, two are the main types of resources that will be committed in their realisation: a) personal time and contacts, and b) funds. It's obvious that commitment of personnel time of the involved partners, will impose some cost to them, even though an indirect cost, that needs to be added in the real cost of travelling and operating / maintaining the pilot unit.

- A large range of contacts with entrepreneur people and organisations
- Significant funds to cover the cost of contacts and presentation of the process to possible investors and maintaining in basic operation the pilot unit
- Funds for continuing the animal feeding trials
- Funds for the information of the academic / research community
- Funds regarding the continue update of the projects website, as well as social network accounts

- Funding regarding the continue Networking effort

5. Administrative part

The role of each partner and the project management structure has been precisely defined in the project's submitted proposal and any changes that occurred during the reference period had been mentioned in the project's progress report, which was submitted on September, 2017. Until the submission of the mid-term report no other changes have been arisen in the project management structure. However, updated detailed tables concerning the organigramme of the project team per each partner, concluding task managers and team members are being presented in **Annex_1_Sub-Annex.1.1. Management Structure per partner.**

During the reporting period, the overall management of the project has worked as planned. More specific, the overall management of the project which is led by ESDAK has as a result to secure until now the adequate collaboration between beneficiaries, to establish the right basis for the successful exploitation of the up to now progress of the project, to organize and to coordinate the production of the project's deliverables and to directly manage and monitor the overall performance of the project. In addition, smooth information flow to the EC and among the project's partners has also been secured, as also the financial control and auditing. Moreover, during this period all reports are on a regular basis submitted to the EC, as it has been planned. On 29th of January, 2019 partners submitted an amendment request to EC requesting for the project's extension for twelve months.

During this reporting period, the following reports have been submitted to the monitoring team and to EC:

1. 28 monthly reports
2. First progress report. Submitted on 19/09/2017, with reference period from 01/09/2016 to 31/07/2017
3. Response to EC letters
4. Amendment request for the project's extension. Submitted on 29th of January, 2019.

6. Technical part

6.1. Technical progress, per Action

The F4F process, due to its actions, has to develop a source separation scheme for food wastes from hospitality sector, since through that separation they become a valuable raw material for the production of feed. For this reason, the main action during the F4F project is the development and operation of a pilot unit producing 40-50 tn of feed/annum. For its construction and operation, as well as evaluation, the main means that will be utilized is the experience and technical and scientific adequacy of the involved partners. In relation to the objectives and the progress per each action for the reference period, the following paragraphs have been developed.

6.1.1. Action B.1.: Development of the Source Separated Food Waste Collection System

Foreseen start date: 01/09/2016	Actual start date: 01/09/2016
Foreseen end date: 31/12/2017	Actual (or anticipated) end date: 31/12/2018

Activity B.1.1: From the kitchen and the table to the F4F unit – evaluating source separation systems, selecting hotels, designing optimum collection route.

Description by HUA: The objective of this sub-action is the evaluation of, (i) the existing source separation system of the organic waste, ii) the storage conditions of these waste, (iii) the deployed tools (bags, bins etc), (iv) the quality and quantity of the separated wastes (composition analysis), and (v) the existing municipal waste collection system.

1. Hotels' waste management system characteristics

The characteristics of 24 hotels (out of 28 targeted four and five stars hotels) were identified and their different waste management activities were recorded (A detailed summary of the survey results is presented in **Annex_2_Sub-Annex.2.1.Selected hotels source separation system qualitatively and quantitatively survey**), through questionnaires and semi-structured interviews with hotel representatives (hotel managers and/or the food and beverages managers).

The questionnaires have been sent via e-mail to the targeted hotel representatives in the area throughout the months of March to May 2017, while the collection of the completed questionnaire that are included in this report was completed and collected via appointments with the hotel representatives during June 2017. In certain cases, the questionnaire was completed and collected during the interview with the hotel representative. The questionnaires were being sent to hotels, which did not respond previously, periodically approximately every 1 or 2 weeks. The questionnaire consisted of four sections (e.g. basic information operational characteristics, environmental policy and waste management). A copy of the questionnaire is attached in **Annex_2_Sub-Annex.2.1. Selected hotels source separation system qualitatively and quantitatively survey**.

The mail-based survey aimed to evaluate the waste management system of the hotels in the study area and record their operational characteristics, the municipal waste collection system as well as to gather the information about the environmental policy already taking place within the tourist industry in the area.

Although there are some differences in certain issues, the situation looks relatively similar for all hotels under investigation (**Annex_2_Sub-Annex.2.1. Selected hotels source separation system qualitatively and quantitatively survey**). Generally, it can be concluded that majority of hoteliers perceive environment as an important factor in the development and well-being of both tourism and hotel industry, at least in terms of intentions.

Four (4) hotels of these were selected to participate in the pilot program and cooperate with the LIFE-F4F project, in order to ensure the required quantity of 1.0-1.5tn of food residues/ day. The three of the selected hotels (Olive Green, Galaxy and Atlantis Hotels) operate all year round (city hotels), while the fourth (Creta Maris) operates for about 70% of the year.

2. Quantities of food residues collected

The quantities of food residues that have been collected and delivered to the Solar drying/ Pasteurisation Pilot Unit, from the operation start-up unit until the end of October, are presented in the following

.

Table 1. Food residues delivered to the Solar drying/ Pasteurisation Pilot Unit (7.5-31.10 2018).

Month	Average daily quantity collected, kg d^{-1}	Total food residues collected, kg
May	**768**	**17,665**
June	**907**	**27,200**
July	**829**	**25,700**
August	**917**	**28,430**
September	**876**	**26,290**
October	**780**	**24,180**
May-October	**849**	**149,465**

The total weight of the collected food wastes for this period amounts to 149.5 metric tonnes. An average of 850 kg per day. The data of the previous table are summarised in the diagram below (Figure 1).

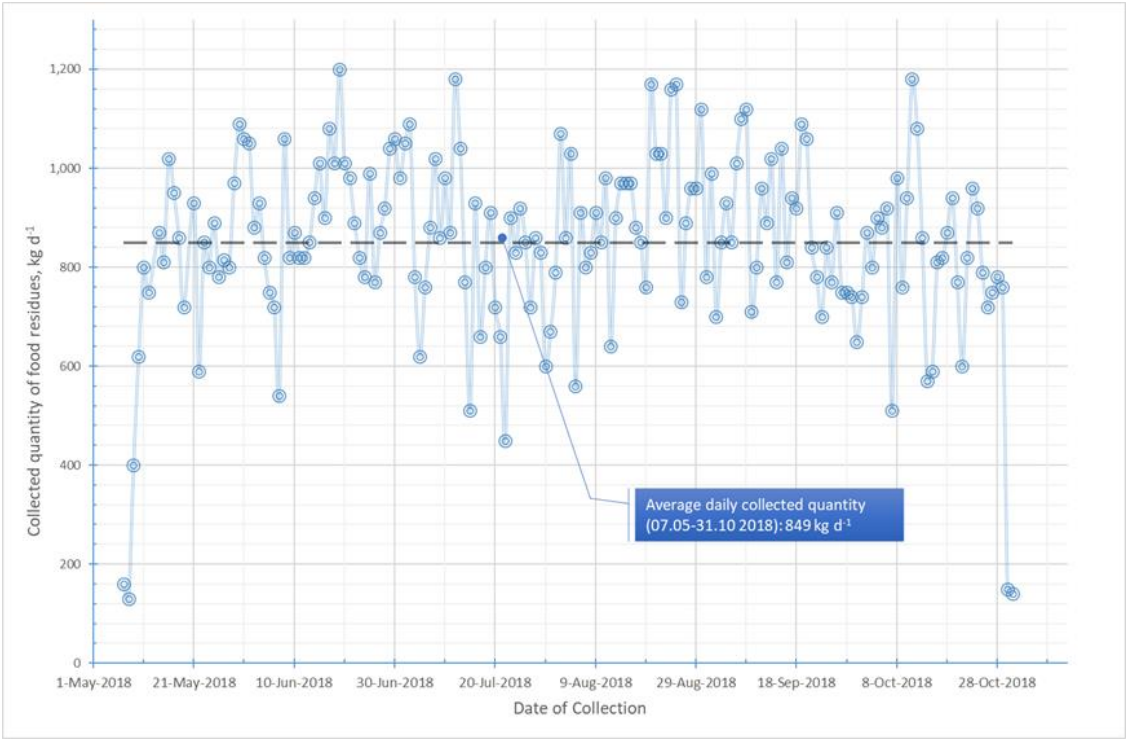


Figure 1. Quantity of food residues collected from the participated hotels (7.5-31.10.2018).

3. Compositional analysis of the Hotels' food waste

In the previous reporting period, HUA team developed the state-of-the-art methodology for conducting the compositional analysis of the source separated food waste (residues) from the hotels. The methodology was based on different technical reports, standards, and scientific papers, as an international standard methodology has not been established yet, while a variety of waste classification systems have been proposed due to the different focus and objectives of each study. The methodology includes procedures for the collection of a representative sample of unprocessed food waste from the waste collection vehicle, manual sorting of the waste into individual waste components, data recording and reporting of the results.

The compositional analysis was executed through Waste Analysis Campaigns (WACs) prior to solar drying/ pasteurisation. The first waste collection and analysis campaign (compositional analysis and microbiological investigation) of the project took place during Autumn 2017 and another one followed in Spring/ Summer 2018. In August 2018, the third waste analysis campaign took place. The fourth and last waste analysis campaign (WAC) took place on the last week of September. During this period food residues from Galaxy Hotel, Aquila Atlantis Hotel, Olive-Green Hotel and Creta Maris Resort Hotel were collected and the seasonal composition of the food residues was determined.

In Figure 2, the composition determined in all WACs, together with the average composition of all the WACs is presented.

Figure 2. Average composition of hotels' food residues from the four WACs.

Harokopio University of Athens (HUA), during the Waste Analysis Campaigns, collected food residues samples and dried feed samples which had been produced at the pilot unit. The samples were analysed for the microorganisms that have been determined for the microbiological analysis (total coliforms, E Coli, Salmonella spp.).

At the same time HUA investigated the existing legislation and performed an extensive literature survey to assess the possible addition of more microorganisms than the initially determined ones (total coliforms, E Coli, Salmonella spp.) that needed to be determined in order to evaluate the possible microbiological load of the food residues more effectively.

The microbiological load (total coliforms, E Coli, Salmonella spp., etc.) was routinely analysed in all food residues and dried product samples collected during Waste Analysis Campaigns (WACs). The collected food residues were also analysed for additional microbiological parameters (e.g. Staphylococcus spp., Clostridium spp., yeast, Listeria monocytogenes).

The results of the last analysis of the sampling campaign in Autumn 2018 that is characteristic of the collected food residues, are presented in the following Table 2.

Table 2. Microbiological Analysis of food residues (25.09-02.10 2018)

Parameter		Input food residues (as received)	Dried product
pH	-	4.85 (±0.55)	5.25 (±0.30)
Density	Kg m^{-3}	569.3 (±66.2)	-
Dry Matter (DM)	%	22.15 (±4.15)	89.88 (±2.76)
Total Coliforms	CFU[(a)]/g dw	$9.57X10^6$ ($\pm1.42X10^6$)	$2.95X10^6$ ($\pm3.14X10^6$)[(d)]
E. Coli	CFU/g dw	$1.09X10^4$ ($\pm2.73X10^3$)	$3.04X10^2$ ($\pm1.90X10^2$)
Salmonella spp.	MPN[(b)]/100ml	N.D.[(c)]	N.D.
Clostridium perfingens	CFU/g dw	$7.00X10^2$ ($\pm3.5X10^4$)[(d)]	N.D.
Staphylococcus spp.	CFU/g dw	N.D.	$6.27X10^5$ ($\pm5.65X10^5$)
Listeria monocytogenes	CFU/g dw	N.D.	N.D.
Listeria spp.	CFU/g dw	N.D.	$1.65X10^4$ ($\pm2.85X10^3$)
Yeast	CFU/g dw	$1.42X10^7$ ($\pm3.64X10^5$)	$7.25X10^6$ ($\pm6.77X10^6$)

Note: (a) Colony forming units per gram dry weight; (b) Most probable number (MPN); (c) Not Detected; (d) Below the detection limits of the method.

4. Design of optimum collection route(s)

The purpose of this part of the sub-action is to demonstrate an optimum routing process for the collection of food residues from hotels sited in the vicinity of the city of Heraklion and the area of Hersonissos in Crete, participating in the programme “Food for Feed: An Innovative Process for Transforming Hotels’ Food Wastes into Animal Feed–LIFE-F4F”.

Optimum routing process is important in order to make the collection system cost effective, making full use of the available resources. To find the optimal route, it is necessary to establish an efficient transit model that enables us to simulate every possible route in advance. In this work, an enhanced algorithm to determine the optimal route was introduced.

The development of the routing process is based on solving the Traveling Salesman Problem (TSP). TSP refers in finding the shortest possible route that starts from a base, visits a given number of places and returns to base. In our simulation the base is the Waste Pretreatment Unit of Heraklion sited in the south of the city airport and the places that should be visited are 28 hotels participating in LIFE-F4F (Figure 3).

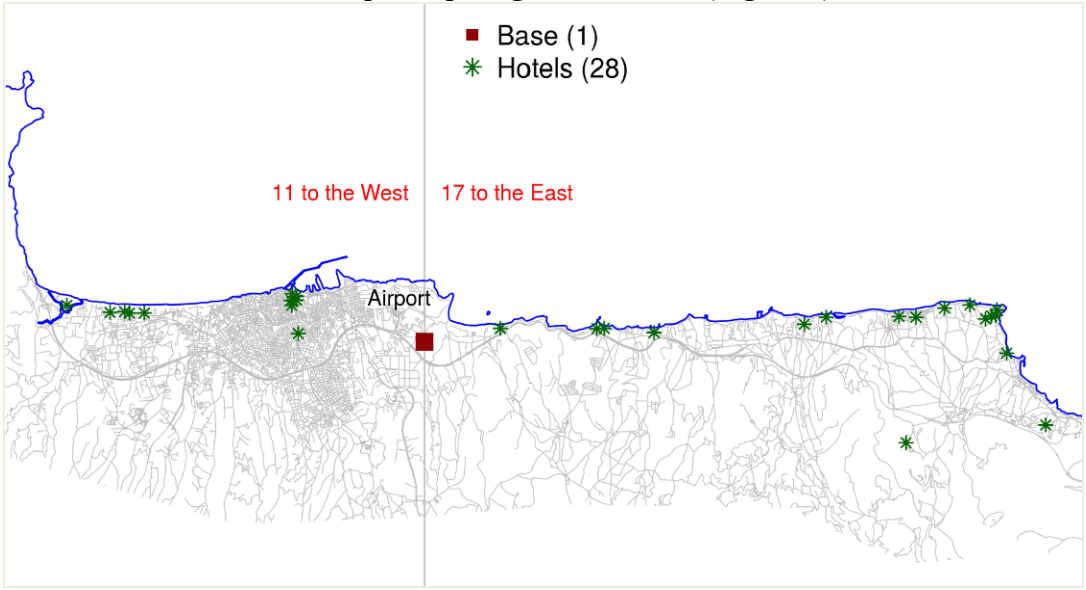


Figure 3. Study area

The above-mentioned application was tested, in various simulations (see **Annex_2_Sub-Annex.2.2. Short listed and selected hotels optimum collection routes**). A simulation example (Figure 4) is the one with the four participating hotels to be served. In this simulation vehicle capacity has not been considered and it's been considered as capable to serve any weight.

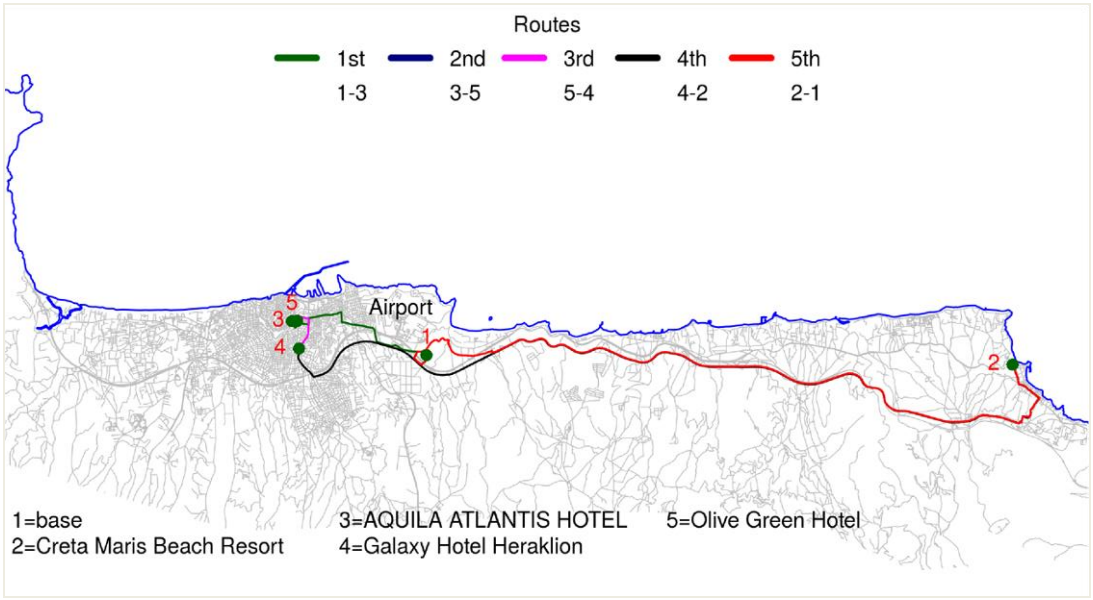


Figure 4. Simulation with the four hotels of the programme F4F.

The identified optimal routes were monitored in real time. The duration of the identified routes compared satisfactorily with the duration in real life. The only insignificant

deviation was the total stall time, as a consequence of the longer than assumed collection time in one of the hotels (Creta Maris). This does not affect the identified routes and can be easily incorporated into the model.

TEIC participation-Complementary actions: The F4F partners decided, regarding action B1 and in relation to the delayed completion and consequent operation of the Solar drying/ Pasteurisation pilot unit, to perform in the facilities of TEIC, a series of unplanned small-scale tests to better accommodate the forthcoming operational period of the pilot unit. The aim of these *additional* actions was the collection of basic information to be adequately prepared for the management of the food residues at the initial operation of the pilot unit.

Specifically, during the period between November 2017 and June 2018, drying rate measurements, composition analysis and physicochemical and microbiological analyses were carried out. The **first** and **third** sampling sessions by TEIC run in parallel with the planned Waste Analysis Campaigns (WACs) carried out by HUA. The **second** sampling took place in March 2018 by TEIC.

HUA, during the first and third sampling sessions, performed the **planned** compositional analysis and microbiological characterisation of the collected food residues, as described in Action B1.1 above. TEIC, during the three sampling sessions, performed small-scale drying experiments.

The experimental work, performed by TEIC, was constituted of two drying experiments at four different temperatures (35 °C, 45 °C, 55 °C and 65 °C) in order to determine the optimum drying temperature and the optimum drying duration. Samples for microbiological analyses were obtained from the food residue as received, homogenised and grinding material, and from the dried end-product at the four different temperatures. The above samples were analysed for Total Mesophilic Flora, *Escherichia coli* and *Salmonella sp., Clostridium spp., Listeria spp., Shigella* and *Campylobacter spp*.

In the second sampling session, which was carried out by TEIC, microbiological analysis of dried samples carried out and dried samples were sent to AUA and FUB for an initial characterisation of the value of the produced dried end-product.

The moisture content of the collected food residues was 70%. The moisture content during drying at 35 °C, was reduced to half after 11 days, while the desired moisture of 12% was achieved after 14 days. During the 45 °C drying, 50% loss of moisture was achieved after 8 days and 88% after 11 days. During the second sampling session, the drying time lasted less in all four temperatures, but the conclusion was the same. Details of the results of this complimentary sub-action that carried out by TEIC are being presented in **Annex_2_Sub-Annex 2.3. Drying and microbiological tests by TEIC.**

For the implementation of part of this action before and during the first initial operational period concerning microbiological analyses in samples as part of the composition survey; TEIC used own funds. However, for the implementation of the first full-scale operation and the optimum operational period of the project, a tender has been conducted by TEIC for specific consumables for analyses and small lab equipment. More details about this tender are being presented in **Annex_2_Sub-Annex 2.4. Tender for consumables by TEIC.**

Activity B.1.2.: Cost estimation methodology for the food wastes collection system

Description by HUA: The objective of this sub-action is development of a proper estimation method for the cost per tonne of food wastes. The methodology is based in GIS/ GPS technology, which allows the introduction of various parameters as for example the hour cost of personnel, the size of the hotels, the quality of the source separation scheme etc.

The importance of cost planning for solid waste management (SWM) is well recognised. The approaches used to estimate costs of municipal or similar waste management can broadly be classified into three categories - the unit cost method, benchmarking techniques and developing cost models using sub-approaches such as cost and production function analysis. The unit cost approach is used to estimate collection and transport costs from the hotels sited in the vicinity of the city of Heraklion and the area of Hersonissos in Crete, participating in the programme "Food for Feed: An Innovative Process for Transforming Hotels' Food Wastes into Animal Feed–LIFE-F4F".

Collection of MSW in Greece, including food waste, is funded through the municipal taxes, paid to the municipalities by households and business. However, in most Greek Municipalities this is a grossly estimated cost, not fully reflecting the real costs per unit weight of waste (i.e. €/t), paid for the collection, transport and disposal of the wastes. This also became apparent during the process of completion of the questionnaires for the characterisation of hotels and the interviews with hotel managers, whereas none of the hotels' management had even an estimated assessment of the cost for the disposal of its waste.

The HUA working team has developed the standards for the GIS/ GPS apparatus and the unique identification of the hotels' bins, necessary for the design of the separate collection system/ optimum routes and the development of a cost estimation methodology. These standards also were included in the tender documents for service provision: «Services for the collection and transportation of organic fraction of municipal solid waste and the operation of pilot unit in the framework of the project life F4F».

The focus is on the aspects of the cost of food residues collection and transport service from the hotels of the general study area to the drying/ pasteurisation pilot plant of the programme (F4F pilot plant). The analysis (see **Annex_2_Sub-Annex.2.5. Food wastes collection cost estimation system**) resulted in an estimated cost of 48.60€ per tonne for collection and transport of the hotels' food residues. This is compared very favourably with the cost of the municipal collection service in the area of 100-110€ per tonne of municipal waste.

Deliverable Name Action B1	Foreseen date	Actual date
List of targeted and selected hotels and their operational characteristics	10/2016	11/2016 Concluded
Selected hotels for the needs of the F4F project cooperation agreements signed	12/2016	12/2016 - 04/2017 Concluded
Selected hotels source separation system qualitatively & quantitative survey	11/2017	11/2017 Concluded
Short listed and selected hotels optimum collection routes	12/2017	05/2018 Concluded
Food wastes collection cost estimation system	12/2017	05/2018 Concluded

Milestone Name Action B1	Foreseen date	Actual date
Initialising qualitatively and quantitative analysis of hotels' source separating food wastes scheme	04/2017	11/2017 Concluded
Completing optimum route trials	10/2017	05/2018

Milestone Name Action B1	Foreseen date	Actual date
		Concluded

6.1.2. Action B.2.: Developing the F4F Pilot Unit

Foreseen start date: 01/09/2016	Actual start date: 01/09/2016
Foreseen end date: 30/06/2017	Actual (or anticipated) end date: 30/06/2018

Activity B.2.1.: Acquisition of the needed licenses for buildings works

The general layout of the F4F pilot unit has been determined. This is in the same land of the bio-drying MSW unit of Municipality of Heraklion. This land has been finally selected due to the direct accessibility from the highway and to the location of the field, as it is almost in the middle of the study area (area with the main hotel units). Moreover, this specific MSW bio-drying unit has plenty of space for the installation of the F4F pilot unit and also has the required infrastructures (for electricity and water supply), as well as a special guarded enclosure. One main reason that this area has finally been selected is that any residue that might occur from the project's production process could be directly disposed into the bio-drying unit. Moreover, this unit has all the required licenses for MSW treatment and for the project's pilot unit construction and operation exemption from licenses that were needed, which would require less time than new licensing approval. Three other areas have been assessed in the project's proposal; however, the optimum area, according to all partners' approval, was this of MSW bio-drying unit. The MSW bio-drying unit treats 75,000tn / yr of MSW and includes the following process steps: 1. Input and weighting of incoming MSW, 2. Uploading and shredding, 3. A 14th day duration of bio-drying, 4. Metals magnetic separation, 5. Compress and bundle of the output MSW and 6. Deodorization and de-dusting of the unit.

All licenses had to be approved/exempt according to the proposal until February, 2017. This procedure finally has been routed at the first days of July, 2017. Exemption from three licenses were finally required for the construction and operation of the F4F pilot unit by Greek authorities, even though the selected area for the construction of the projects' pilot unit had all relevant licenses for waste management procedures. The environmental, the building and the operational licenses' procedures for the approval or exemption are being presented in the following Tables 3, 4 and 5 below. This is a five (5) month delay as all licenses were foreseen to be routed at the end of February and finally, due to Greek authorities delay this procedure concluded at the first days of July, 2017. The main delay occurred to the operational license, due to bureaucracy. More details about licensing procedure are presenting in the following Tables.

Table 3. Building licensing procedure

PROCEDURE REGARDING BUILDING LICENSE AND LAND USES
• **9-3-2017:** The document of ESDAK with the protocol No. 421/9-3-2017 submitted to the Directorate of Urban Planning of Municipality of Heraklion in order to request the building license.
• **11-4-2017:** The Directorate of Urban Planning of Municipality of Heraklion accepts the request according to their document with protocol No. 27098/11-4-2017.
• **15-5-2017:** The file of ESDAK with the protocol No. 821/15-5-2017 submitted to the Directorate of Urban Planning of Municipality of Heraklion in order to certify the "land uses" in the area.
• **21-6-2017:** The Directorate of Urban Planning of Municipality of Heraklion responds to the request according to their document with protocol No. 56294/**21-6-2017**.
• **3-7-207:** The Directorate of Urban Planning of Municipality of Heraklion responds to the request of ESDAK with protocol No. 421/9-3-2017 which exempts the pilot unit from a building license

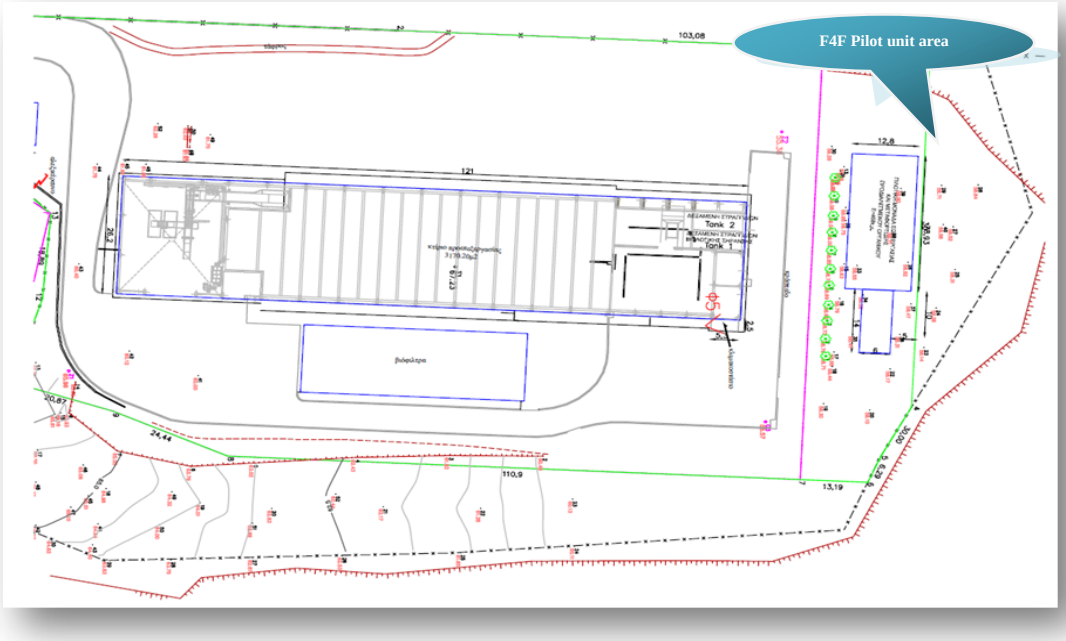
Table 4. Environmental licensing procedure

PROCEDURE REGARDING ENVIRONMENTAL LICENSE
• **31-3-2017:** According to the document with the protocol No. 578/31-3-2017, ESDAK submitted a

PROCEDURE REGARDING ENVIRONMENTAL LICENSE
compliance plan regarding the decision with protocol No. 223/8-3-2017 of Approval of Environmental Terms for the existing work “Pretreatment Unit for municipal solid waste” at the place “Mantra” or “Mavros Spilios” of Municipality of Heraklion, Region of Crete, in order to exempt the Pilot Unit from environmental license. • **11-5-2017:** The Directorate of Environment and Spatial Planning of the Region of Crete accept the request according to the document with the protocol No. 1109/11-5-2017.

Table 5. Operating licensing procedure

PROCEDURE REGARDING OPERATION LICENSE
• **31-3-2017:** According to the document with the protocol No. 579/31-3-2017, ESDAK submitted a technical file of the Pilot Unit to the Directorate of Industry, Energy and Natural Resources of Region of Crete in order to examine the procedure for the acquisition of the operation license • **11-5-2017:** After communication (telephone and e-mail) and meeting with the responsible authorities in the Office of Vice-Governor for Spatial Planning and Environment of Region of Crete, they requested to fulfill and submit a questionnaire (Annex I of 483/35/Φ.15/17.1.2012 ministerial decision) in order to determine the category and the relevant documents required for the operation license • **12-5-2017:** According to the document with the protocol No. 810/12-5-2017, ESDAK submitted the questionnaire of Annex I for the Pilot Unit of F4F. Complementary, by phone they requested the documents for the other licenses (building and Environmental) as well as for land uses • **12-7-2017:** Answer of Directorate of Industry, Energy and natural Resources with protocol No. 3228/Φ14Γ/12-7-2017. specifying supporting documents for the exemption from the obligation to supply an installation and operating license



Picture 1. Topographical diagram of the F4F pilot unit into the area of MSW bio-drying unit of Heraklion.

In **Annex_3_Sub-Annex 3.1. Licenses,** please find attached the topographical plan with the pilot unit general layout and all requests submitted to the relevant authorities for licenses’ procedures regarding: building license, land uses, environmental license and operation license.

Activity B.2.2.: Construction of the required units

For the construction of the required units, ESDAK had to conduct a relevant public tender. According to the approved project's timetable, this public tender had to be completed until January, 2017 and the unit's buildings had to be completed until June, 2017. However, due to the project's progress delays occurred, finally all these procedures were delayed for twelve (12) months.

In brief, the change in public tenders conduction legislation affects the public tender concerning the pilot unit construction. The delay for the completion of this tender had also to do with the exemption from licensing procedures for the construction and operation of the pilot unit in the selected area, as it was not possible this tender to be published if the area for the installation of the pilot unit was not legally approved by all relevant public services. Immediately after all licensing approvals/exemptions routing for the construction of the pilot unit, ESDAK made the first step for this tender, which was the primary request to the Financial Service of ESDAK for the procurement of equipment and materials for the pilot unit and construction of the infrastructure in the framework of the project life F4F (Protocol No 1098/26-6-2017). All these bureaucracy procedures for the public tendering conduction and the needed studies development concluded with the Contract signing (Protocol No 292/8-2-2017), within six months. More details concerning the procedure of this tender are presented in Table 6 below.

Table 6. Tendering procedure for the construction of the pilot unit

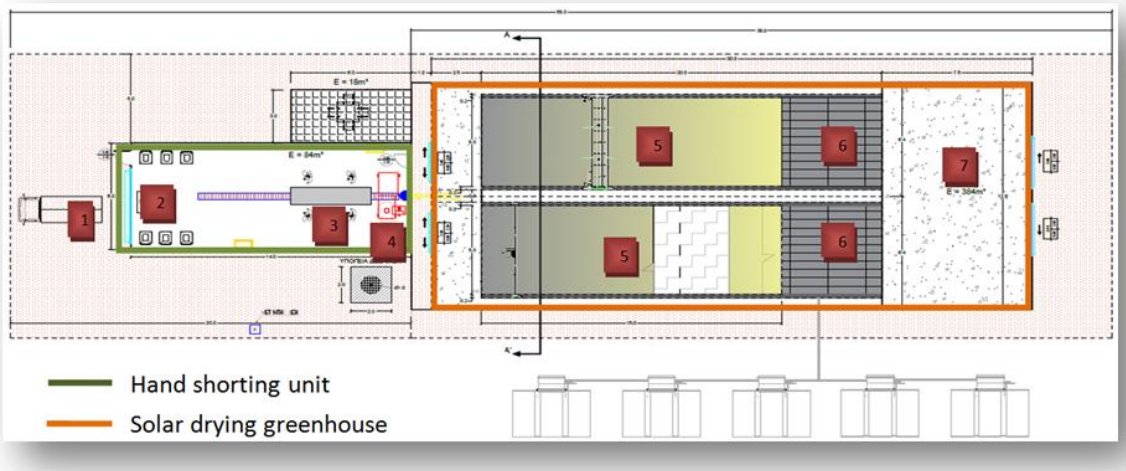
Procurement of equipment and materials of the pilot unit and construction of the infrastructure in the framework of the project life F4F	**Date**
Primary request to the Financial Service of ESDAK for the procurement of equipment and materials of the pilot unit and construction of the infrastructure in the framework of the project life F4F (Protocol No 1098/26-6-2017)	26/6/2017
Publication of Primary request to Central Electronic Registry of Public Contract (KHDMS) (KHDMS No: 17REQ001598774)	28/6/2017
Credit Acceptance (No. 96/2017 ESDAK Decision)	3/7/2017
Publication of Decision of ESDAK's Executive Committee (EC) –Acceptance of primary request (KHDMS No: 17REQ001962226)	19/9/2017
Acceptance to conduct the procurement via National Electronic Public Procurement System (NEPPS) (No. 55/2017 Decision of ESDAK's EC)	21/3/2017
Acceptance of the study and tender documents for the procurement of equipment and materials of the pilot unit and construction of the infrastructure in the framework of the project life F4F (No. 162/2017 Decision of ESDAK's EC)	21/3/2017
Appointment of the tender committee for the procurement of equipment and materials of the pilot unit and construction of the infrastructure in the framework of the project life F4F (No. 97/2017 & 133/2017 Decision of ESDAK's EC)	21/8/2017
Publication of the proclamation to KHDMS (KHDMS No:17PROC002085038)	13/10/2017
Publication of the proclamation to the newspapers	17/10/2017
Publication of the declaration of the procurement and Annexes to KHDMS (KHDMS No:17PROC002085180)	13/10/2017
Publication of the proclamation to diavgeia.gov.gr (Diavgeia No: ΩΩΝΙΟΡ2Ω-Γ7Ε)	13/10/2017
Publication of the procurement (with No. 46889) to NEPPS's portal	13/10/2017
Deadline for offers submission	6/11/2017
Opening supporting documentation and technical offers via NEPPS system	19/12/2017
Approval of the 1st record of the tender committee (No. 205/2017 Decision of ESDAK's EC)	13/12/2017
Opening of the financial offers	19/12/2017
Approval of the 2nd record of the tender committee (No. 208/2017 Decision of ESDAK's	19/12/2017

Procurement of equipment and materials of the pilot unit and construction of the infrastructure in the framework of the project life F4F	Date
EC)	
Invitation to submit supporting documents of the award (Protocol No 2571/21-12-2017)	21/12/2017
Approval of the 3rd record of the tender committee and award of the tender (No. 1/2018 Decision of ESDAK's EC)	15/01/2018
Invitation to sign the contract (Protocol No 115/19-01-2018)	19/01/2018
Contract signing (Protocol No 292/8-2-2017)	8/02/2018

Concerning the construction of the pilot unit, the contractor signed the relevant contract on February, 2018. Even thought the duration of this contract was for 45 days, which would be terminated at the end of March, the contractor requested a 45 days' extension of the relevant contract and delivered to ESDAK the pilot unit at the end of May, 2018. This is a twelve month delay for the project's progress. These extra 45 days were requested by the contractor as during the construction unforeseen factors contributed to further delays, such us weather conditions (intense winds during the greenhouse installation didn't allow the polycarbonate sheets placement on to the metal frame of the greenhouse for more than three weeks). Moreover, during the construction of the unit extra unforeseen optimizations were carried out (perimeter reinforcement with concrete of the greenhouse base due to specific ground requirements, mechanical equipment in the pre-treatment unit settings, etc. lead to 3 more weeks delay,) so as the operation of the unit to better meet the needs of the project. In total, from all these issues mentioned above, a 12 month delay occurred in the project's progress. Finally, the start up of the initial operational period for the project was on July, 2018.

No technical changes have been occurred in the pilot unit from what it was foreseen. This tender concerned the supply and the installation of the equipment and infrastructure of the pilot unit. It included a solar drying greenhouse, with entrance, exit doors and roof windows with a motor. Metal shed, mechanical equipment and pre-treatment materials (a work bench, a PVC curtain, 4-seater hand shorting conveyor belt, a high performance chopper / pulper with a special hopper, INOX drying halls and a suction / vacuum feeder pump, electrical equipment table). Configuration of the surrounding area and required excavations for the pilot plant as a whole, pilot unit floor construction and underground wastewater collection tank, asphalt cover of the pilot site surrounding area, piping network connection and pilot drainage with the corresponding bio-drying unit of Municipality of Heraklion and the construction of the pretreatment building, were also included. Moreover, the greenhouse polycarbonate cover, the underfloor heating system for drying halls, pipe suitable to be used for feed transfer (from the pretreatment hall to the drying halls), two inverter cooling units in the 10°C, an insect greenhouse net, fire protection of the pilot unit as well as the thunderstroke protection. The hydraulic and electrical installation of the unit was also included in this tender. In Picture 2 below the plan view of the pilot unit is presented and the panoramic view of the unit is presented in Picture 3. The total area of the pilot unit is 880m^2 and the pilot unit (solar drying greenhouse and pretreatment unit) area is 468m^2.

More analytical details about the tendering procedure for the pilot unit construction are presented in **Annex_3_Sub-Annex 3.2. Tender for pilot unit Construction** and more analytical details presenting the construction of the pilot unit are presented in **Annex_3_Sub-Annex 3.3. Pilot Unit and turners Construction.**



Picture 2. PLAN VIEW of the Pilot Unit.

Picture 3. Panoramic view of the pilot unit.

Activity B.2.3.: The turners, the floor heating system and various other equipment

In this sub-action, partners from TEIC were responsible for the construction of two different types of turners, a vertical and a horizontal one. According to the approved project's timetable the turners had to be delivered to the unit until June, 2017. However, the public procurement from TEIC couldn't be carried out before the official licensing approval by legal authorities for the construction of the pilot unit. Up to the licensing settlement for the construction of the unit any action for the publication of the tenders couldn't be carried out. Even though any action hasn't been made for the publication of the tenders during this period, partners from TEIC have collected all the required data for this action, from the beginning of the project so as to be able to prepare the relevant tenders in detail. In total, three tenders were published, one for consumables, one for equipment and one for external assistance. Tendering procedure actions for the turners' construction started by TEIC on September, 2017 (licensing procedures settlement on July 2017). These tendering procedures were coincided with TEIC official elections vote for Rector and Vice Rectors, which are carried out every four years. On November 2017 the official elections' vote for Rector and Vice Rectors in TEIC which were carried out. During this election period, the new Rector and the Vice Rectors were elected under a

new legal framework for the first time (Law 4485 FEK No.114 _ 04/08/2017). After the conclusion of the elections, the new elected Rector and the Vice-Rectors have been officially authorized (FEK No. 663 _ 30/11/2017). However, the assignments of responsibilities of Vice rectors were officially authorized by TEIC on February, 2018 to be able to perform their duties in the Institute (FEK No. 203_30/01/2018). The assignments of the official document couldn't be signed until the new vice rectors were officially declared as the main representatives of the Institute. This procedure lasted for about three months. This delay affects the tendering procedures, causing a corresponding 3-month delay. The solar drying turners were foreseen to be delivered on June, 2017 and finally were delivered with a twelve month delay, on June 2018. However, this was not a delay for the project's progress, as the construction of the unit was also delayed for the same period. Finally, the turners were delivered about the same time with the completion of the pilot unit construction. Details about these three tenders are presented in the following three Tables 7, 8, and 9 below.

Table 7. Tendering procedure for consumables for solar drying turners construction

Procurement of consumables and materials of the pilot unit of the project Life F4F	**Date**
Request to the Management Committee of ELKE TEIC for the procurement of consumables for the pilot unit of the project life F4F. All relevant tender documents with technical information for the procurement of consumables are included. (Request No 7956/22-9-2017).	22/09/2017
Acceptance of request / Appointment of the tender committee (Decision 772/27-09-2017)	27/09/2017
Publication of Decision of TEIC's Management Committee (EC) to Central Electronic Registry of Public Contract (KHMDS) (KHMDS No: 17REQ002045530)	05/10/2017
Publication of the tender (Protocol: 5743/06-10-2017)	06/10/2017
Publication of the tender to KHDMS (KHDMS No:17PROC002052406) and to Diavgeia.gov.gr (ADA: 6ΝΛΒ4691Ο3-ΩΟ1).	06/10/2017
Publication of the tender to the TEIC's portal	06/10/2017
Deadline for offers submission	23/10/2017
Opening supporting documentation, technical and economical offers of the companies "SEVASTAKIS & SIA O.E." & "SIFAKIS SFAKIANAKIS O.E."	24/10/2017
Approval of the record of the tender committee (Decision 779/22-11-2017 of Management Committee of ELKE of TEIC)	22/11/2017
Publication of the Decision to KHMDS (17AWRD002321694) and to Diavgeia.gov.gr (ADA: 75ΘΖ4691Ο3-115)	29/11/2017
Contract signing (Protocol No 8150/14-12-2017 and 8152/14-12-2017))	14/12/2017
End Date of Contracts	31/05/2018

Table 8. Tendering procedure for equipment for solar drying turners construction

Procurement of equipment of the pilot unit of the project life F4F	**Date**
Request to the Management Committee of ELKE TEIC for the procurement of equipment for the pilot unit of the project life F4F. All relevant tender documents with technical information for the procurement of equipment are included. (Request No 7957/22-9-2017).	22/09/2017
Acceptance of request / Appointment of the tender committee (Decision 773/04-10-2017)	04/10/2017
Publication of Decision of TEIC's Management Committee (EC) to Central Electronic Registry of Public Contract (KHMDS) (KHMDS No: 17REQ002138097)	24/10/2017
Publication of the tender (Protocol: 6277/24-10-2017)	24/10/2017
Publication of the tender to KHDMS (KHDMS No:17PROC002138382) and to Diavgeia.gov.gr (ADA: ΩΖΜΥ4691Ο3-ΟΕΤ).	24/10/2017

Procurement of equipment of the pilot unit of the project life F4F	Date
Publication of the tender to the TEIC's portal	24/10/2017
Deadline for offers submission	08/11/2017
Opening supporting documentation, technical and economical offer of the company "AGGELOS PATERAKIS & SIFAKIS SFAKIANAKIS O.E."	09/11/2017
Request to the Management Committee of ELKE TEIC for approval of the record of the tender committee.	25/01/2018
Approval of the record of the tender committee (Decision 788/07-02-2018 of Management Committee of ELKE of TEIC)	07/02/2018
Publication of the Decision to KHMDS (18 AWRD002864288)and to Diavgeia.gov.gr (ADA: ΨΣΜΡ4691Ο3-6PY)	27/03/2018
Contract signing (Protocol No 2666/28-03-2018)	28/03/2018
End Date of Contracts	27/06/2018

Table 9. Tendering procedure for external assistance for solar drying turners construction

Procurement of external assistance of the pilot unit of the project life F4F	Date
Request to the Management Committee of ELKE TEIC for the procurement of external assistance for the pilot unit of the project life F4F. All relevant tender documents with technical information for the procurement of external assistance are included. (Request No 7958/22-09-2017).	22/09/2017
Acceptance of request / Appointment of the tender committee (Decision 773/04-10-2017)	04/10/2017
Publication of Decision of TEIC's Management Committee (EC) to Central Electronic Registry of Public Contract (KHMDS) (KHMDS No: 17REQ002136960)	24/10/2017
Publication of the tender (Protocol: 6273/24-10-2017)	24/10/2017
Publication of the tender to KHMDS (KHMDS No:17PROC002137169) and to Diavgeia.gov.gr (ADA: 73324691Ο3-B35).	24/10/2017
Publication of the tender to the TEIC's portal	24/10/2017
Deadline for offers submission	08/11/2017
Opening supporting documentation, technical and economical offers of the companies "AGGELOS PATERAKIS" & "SIFAKIS SFAKIANAKIS O.E."	09/11/2017
Request to the Management Committee of ELKE TEIC for approval of the record of the tender committee.	25/01/2018
Approval of the record of the tender committee (Decision 788/33ο/07-02-2018 of Management Committee of ELKE of TEIC)	07/02/2018
Publication of the Decision to KHMDS (18 AWRD002863601)and to Diavgeia.gov.gr (ADA: ΩΔΜΙ4691Ο3-9ΨΓ)	09/02/2018
Contract signing (Protocol No 2664/28-03-2018 & 2665/28-03-2018)	28/03/2018
End Date of Contracts	27/06/2018

Picture 4. The turners into the drying unit of the F4F pilot unit. Under the inox drying halls there is the thermal drying system

More analytical details concerning the completion of tendering procedure of this sub-action are presented in **Annex_3_Sub-Annex 3.4. Tenders for turners' construction** and analytical details for the turners' construction are presented in report in **Annex 3_Sub-Annex 3.3. Pilot Unit and turners' Construction.**

Deliverable Name Action B2	Foreseen date	Actual date
All licenses for the development of the pilot unit	02/2017	07/2017 Concluded
The building for sorting and grinding and the solar drying halls	05/2017	06/2018 Concluded
The full operational solar drying pilot unit	07/2017	06/2018 Concluded
The solar drying turners and various other equipment	06/2017	06/2018 Concluded

Milestone Name Action B2	Foreseen date	Actual date
Construction works initiated	03/2017	02/2018 Concluded
Construction works completed	05/2017	06/2018 Concluded
Turners delivered	05/2017	06/2018 Concluded
Unit delivered	06/2017	06/2018 Concluded

6.1.3. Action B.3.: Initiating, Operating and Optimising the F4F System

Foreseen start date: 01/09/2016	Actual start date: 01/09/2016
Foreseen end date: 28/02/2020	Actual (or anticipated) end date: 28/02/2021

Activity B.3.1.: Tendering the waste collection and hand sorting service

The change in the tender legislation (as it has been analytically presented in the submitted amendment request) also affects the public tender concerning the tender for the food waste collection system. However, the first step for this tender was carried out by ESDAK at 1st of February 2017 with the primary request to the Financial Service of ESDAK for service provision «Services for the collection and transportation of organic fraction of municipal solid waste and the operation of pilot unit in the framework of the project life F4F» (Protocol No 207/1-2-2017). This public tender has been concluded on January 2018 (contract signing, Protocol No 11/5-01-2018) with a delay of 6 months, taking into account that for Action B1 the collection system had to be operated on July, 2017.

This tender includes the collection of the MSW during the initial period of the F4F project and the collection of the MSW during the full and the optimum operational period of the F4F project. The project partners have decided to conduct one tender for the three project operational periods instead of two for the two actions (B1 & B3) as it was foreseen, in order to save time both from the tendering procedure, as it is an open tender and it is time –consuming and from the operation of this service by the contractor due to its experience from the first operational period of the project. So this public tender concerns Actions B1 and B3 in total. The contractor signed the relevant contract on 5th of January 2018. The tendering procedure is presented in detail in the following Table 10. The contractor is responsible for the collection of the hotels' food wastes with a refrigerator truck as well as for the hand sorting and the operation of the pre-treatment unit, which comprises the supplying of the solar drying halls with the pulp, after food wastes hand sorting and pulverizing. The collection from the cooperative hotels started officially on May, 2018.

In **Annex_4_Sub-Annex 4.1. Tendering procedure for waste collection system**, please find attached relevant documents concerning the tender for the food waste collection system. In **Annex_4_Sub-Annex 4.2. Initial operational period**, please find relevant report concerning the service of the food waste collection system from hotels.

Table 10. Tendering procedure for external assistance for solar drying turners construction

Service Provision: "SERVICES FOR THE COLLECTION AND TRANSPORTATION OF ORGANIC FRACTION OF MUNICIPAL SOLID WASTE & THE OPERATION OF PILOT UNIT IN THE FRAMEWORK OF THE PROJECT LIFE F4F"	**Date**
Primary request to the Financial Service of ESDAK for service provision « Services for the collection and transportation of organic fraction of municipal solid waste and the operation of pilot unit in the framework of the project life F4F » (Protocol No 207/1-2-2017)	1/2/2017
Publication of Primary request to Central Electronic Registry of Public Contract (KHDMS) (KHDMS No: 17REQ005750962)	1/2/2017
Credit Acceptance (No. 25/2017 ESDAK Decision)	1/2/2017
Publication of Decision of ESDAK's Executive Committee (EC) –Acceptance of primary request (KHDMS No: 17REQ005786572)	10/2/2017
Acceptance to conduct the procurement via National Electronic Public Procurement System (NEPPS) (No. 55/2017 Decision of ESDAK's EC)	21/3/2017

Service Provision: "SERVICES FOR THE COLLECTION AND TRANSPORTATION OF ORGANIC FRACTION OF MUNICIPAL SOLID WASTE & THE OPERATION OF PILOT UNIT IN THE FRAMEWORK OF THE PROJECT LIFE F4F"	Date
Acceptance of the study and tender documents for service provision: «Services for the collection and transportation of organic fraction of municipal solid waste and the operation of pilot unit in the framework of the project life F4F» (No. 57/2017 Decision of ESDAK's EC)	21/3/2017
Committees constitution for the procurement : «Services for the collection and transportation of organic fraction of municipal solid waste and the operation of pilot unit in the framework of the project life F4F» (No. 56/2017 Decision of ESDAK's EC)	21/3/2017
Publication of the procurement to KHDMS (KHDMS No:17PROC001566895)	21/6/2017
Publication of the detailed procurement and Annexes to KHDMS (KHDMS No:17PROC001567101)	21/6/2017
Publication of the procurement to diavgeia.gov.gr (Diavgeia No: Ω7ΘΚΟΡ2Ω-ΓΤ6)	21/6/2017
Publication of the procurement (with No. 41442) to NEPPS's portal	21/6/2017
Deadline for offers submission	21/7/2017
Opening supporting documentation and technical offers via NEPPS system	28/7/2017
Approval of the 1st record of the tender committee (No. 126/2017 Decision of ESDAK's EC)	9/8/2017
Opening of the financial offers	22/9/2017
Approval of the 2nd record of the tender committee (No. 158/2017 Decision of ESDAK's EC)	4/10/2017
Invitation to submit supporting documents of the award (Protocol No 1936/18-10-2017)	18/10/2017
Approval of the 3rd record of the tender committee and award of the tender (No. 180/2017 Decision of ESDAK's EC)	13/11/2017
Invitation to sign the contract (Protocol No 2344/29-11-2017)	29/11/2017
Contract signing (Protocol No 11/5-01-2018)	5/1/2018

Picture 5. The refrigerator track for the food waste collection system from hotels

Activity B.3.2.: Initial operational period

The main objective of this period is the operation of the F4F system under real conditions, aiming to determine the operational parameters including performance and operational costs, as well as to identify possible short comings, problems, limitations and required technical additions or improvements to the original idea and set up.

The pilot unit has been fully completed at the end of May 2018 and the official acceptance by ESDAK was at the beginning of July 2018. However, partners at the first days of May and in order to save time and to test the operation of the pretreatment unit equipment started some trials only in the pretreatment unit (as the solar drying unit wasn't still completed). During the first days of May till end of June 2018 about 44tn of food wastes were collected from the four cooperating hotels. This action was carried out so as composition analyses under real circumstances, hand sorting and physicochemical

analyses of the collected first material to take place, after thermal drying of the pretreated product in the facilities of TEIC. The solar drying unit has been completed at the end of May 2018 and during June 2018 the solar drying turners were also completed.

However, due to the delays occurred and in order partners to save time, some trials took place with collected food wastes from hotels on November 2017, where composition analyses, physicochemical analyses and drying tests carried out. Moreover, on March 2018 partners also carried out some trials concerning drying tests and physicochemical analyses. The drying test (as has also been mentioned in Action B1) from this period was thermal drying in ovens in facilities of TEIC.

The official initial operational period of the project started on 1st of July 2018 until 31st of October, 2018. This is a 12 month delay of the project and a 4 month operation under real conditions. During this period about 105tn of food wastes have been collected from the hotels. In total, from the first days of May till the end of October 2018 about 150tn of food wastes have been collected and pretreated in the pilot unit. From this quantity the 105tn have been treated in the solar drying unit. During this period, many different drying tests in combination with weather conditions, the use of the under-floor heating system and the testing trials on the use of the drying turners were carried out. Samples for analyses sent to all partners and two composition analyses were carried out in this operational period. The drying rate of the drying product with the horizontal turner in the pilot unit is presented on the following table.

Table 11. Drying rate in the solar drying pilot unit during September – October, 2018 – Horizontal turner

Drying (days)	1st day 17/09/2018	2nd day 18/09/2018	4th day 20/09/2018	8th day 24/09/2018
Moisture (%)	68%	64%	40%	15%

The fact that the product's moisture within a week can be reduced to a final percentage of about 15% is very encouraging, taking into account that this rate was during autumn. Partners are very optimistic about this drying procedure for the next operational period. It also has been proposed by partners to investigate the possibility of thermal drying of the product from moisture content from 30% to 10-12% at 90° C in order to achieve final product pasteurization and a faster moisture rate reduction.

The physicochemical characteristics of the produced dry product in the pilot unit are presented by each partner in their respective actions (HUA and TEIC in Action B1, AUA in action B4 and FUB in Action B5).

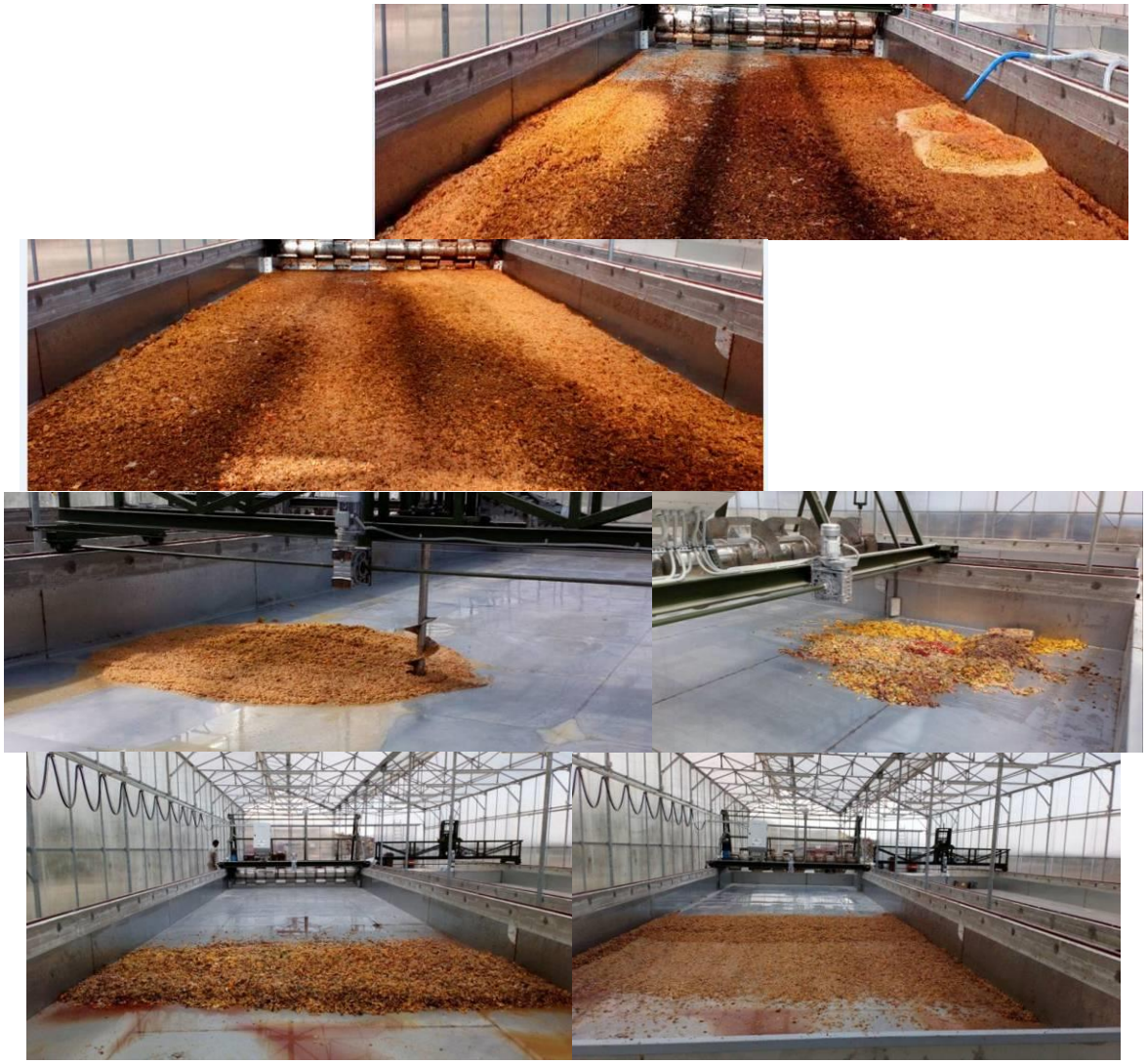
Stages during the operation of the pilot unit are presented in the following pictures.

Picture 6. During transferring food wastes from the collected from hotels bins into the pretreatment unit

Picture 7. During hand sorting on the conveyor belt in the pretreatment unit

Picture 8.The pulp after grinding

In the pictures below the operation of the drying turners into the solar drying unit is presented.



Picture 9. During solar drying in the pilot unit

Picture 10. The final product from the first operational period in the F4F pilot unit

Picture 11. Packing of the final solar dried product of the F4F pilot unit

Picture 12. Samples from the final product sent to partners

Picture 13. The final product of the first initiating operational period of the LIFE-F4F project

More details concerning this first operational period of the F4F pilot unit are presented in **Annex_4_Sub-Annex 4.2. Initial operational period**. In this report partners also presents problems encountered during this first operational period and suggestions for

technical and operational optimizations. Moreover, proposals about the optimization in the construction and operation of the pilot unit are also presented by partners.

Activity B.3.3.: 1st full scale operational period

As the conclusion of the initial operational period was delayed for twelve months, the start up of the first full scale operational period is expected on May, 2019, in case of the approval of the submitted extension request, as the project progress is behind schedule for twelve months. No deliverables in this sub-action for the reporting period are being submitted.

Activity B.3.4.: 2nd and optimum operational period

Following the first full scale operational period, the start up of the second optimum operational period consequently is being expected on May, 2020, in case of the approval of the submitted extension request. No deliverables in this sub-action for the reporting period are being submitted.

Deliverable Name Action B3	Foreseen date	Actual date
Data, results and feed produced, during the initiating operational period	01/2018	01/2019 Concluded
Data, results and feed produced, during the first full scale operational period	01/2019	01/2020 Due to amendment request
Optimum operational mode	12/2019	12/2020 Due to amendment request
Data, results and feed produced, during the optimum operational period	01/2020	01/2021 Due to amendment request
Data, results and biodiesel produced during project	01/2020	01/2021 Due to amendment request

Milestone Name Action B3	Foreseen date	Actual date
Initiating the 1st year of operation (initial operational period)	07/2017	07/2018 Concluded
Initiating the 2nd year of operation (1st full scale operational period)	04/2018	04/2019 Due to amendment request
Initiating biodiesel production for truck	08/2018	08/2019 Due to amendment request
Initiating the 3rd year of operation (2nd full scale optimum operational period)	04/2019	04/2020 Due to amendment request
Completing the 3rd year of operation (2nd full scale optimum operational period)	11/2019	11/2020 Due to amendment request

6.1.4. Action B.4.: Evaluating the Produced Feed for Pigs and Poultry Husbandry

Foreseen start date: 01/01/2017	Actual start date: 01/01/2017
Foreseen end date: 31/12/2019	Actual (or anticipated) end date: 31/12/2020

Activity B.4.1.: Analysis of produced feed

According to obligations derived from Action B4 entitled "Evaluating the Produced Feed for Pigs and Poultry Husbandry" the AUA took representative samples from the food wastes under testing, at different times periods for a number of chemical and myxotoxins analyses. More precisely were analyzed:

- In December 2017, 4 samples in triplicates for chemical analysis
- In March 2018, 12 samples in triplicates for chemical analysis
- In July 2018, 18 samples in triplicates for chemical analysis
- In July 2018, 4 samples for carbohydrates content analysis
- In July 2018, 6 samples for soluble protein and non soluble nitrogen determination (samples content)

The chemical analysis of the samples was performed for dry matter (DM), crude protein (CP), ether extracts (EE), ash and crude fiber (CF). The difference among the samples was their drying temperature (T) (T=35^{o}C, T=45^{o}C, T=55^{o}C, T=65^{o}C).

The aim of those analyses was to find out:

a. The effect of temperature during the drying procedure on their chemical composition and on nitrogen (N) solubility
b. The variability on their chemical composition of the different dried batches
c. The samples content in carbohydrates (fructose, glucose, maltose and starch)

The mycotoxins' level of the dry samples was also determined to be sure that there is no contamination during the whole process (from collection to sampling for testing and use).

From those results, it is concluded that despite their variability, the drying temperature has no effect on the samples chemical composition. The observed variability is rather expected since there is variability in the raw (wet) material for drying. In addition, no credible statistical analysis of the results can be performed due to the small number of samples tested at each occasion (n=3-4). Further to that, at the end, if the total amount of each batch will be grinded and mixed properly, then the outcome will be homogeneous with lower variability.

No great variability exists among the four samples as the individual carbohydrates content is concerned. There are no significant differences among them are also due to the same reasons explained before the samples' chemical composition. No mycotoxin's contamination was found in the examined samples.

The overall objective of the above analyses was to be decided the optimal drying conditions (temperature/duration of the drying process) which should be applied in the material (waste) at the operation unit.

Analytical details about the results concerning this action are presenting in **Annex_5_Sub-Annex 5.1. Analysis of produced feed_AUA.**

Activity B.4.2.: Animals feeding trials

Based on the above results, the AUA has decided to carry out experiments with broilers and fattening pigs. For this purpose, the experimental units for poultry and pigs have been prepared and their respected diets have been formulated. The inclusion percentages of the under test dry material will be 15% for the broilers and 10% for the pigs.

No deliverables in this sub-action for this reference period.

Activity B.4.3.: Additions and alterations in the pilot unit

No deliverables in this sub-action for this reference period.

Deliverable Name Action B4	Foreseen date	Actual date
Complete chemical analysis of the produced feed, through the pigs and poultry husbandry perspective	10/2018	10/2019 Due to amendment request
Indications of shortcomings of the production process, in relation to the product's use for pigs and poultry husbandry, and suggestion for improvements.	12/2018	12/2019 Due to amendment request
Economic evaluation of the produced feed, regarding pigs and poultry husbandry	12/2018	12/2019 Due to amendment request
Complete evaluation of the produced feed for pigs and poultry husbandry	12/2019	12/2020 Due to amendment request

Milestone Name Action B4	Foreseen date	Actual date
Initiating trials regarding F4F product utilisation as pigs and poultry feed	10/2017	10/2018
Completing trials regarding use as pigs and poultry feed	10/2019	10/2020 Due to amendment request

6.1.5. Action B.5.: Evaluating the Produced Feed as Pet Food

Foreseen start date: 01/01/2017	Actual start date: 01/01/2017
Foreseen end date: 31/12/2019	Actual (or anticipated) end date: 31/12/2020

Activity B.5.1.: Analysis of the feed

In total, 37 samples of food wastes have been analyzed by FUB until September 2018 (n=16 of the first sampling period; n=9 of the second sampling period; n=9 of the third sampling period; n=3 of the final product). The analyzed parameters included dry matter, crude protein, crude fat, crude fiber, crude ash, minerals, amino acids and taurine (Annex 6, Tables 1-12).

Although the composition of the samples differed, the analyzed nutrient concentrations showed only moderate variations among the samples for the first sampling period (Annex 6, Tables 2 and 7). The same applied for the second sampling period (Annex 6, Tables 3 and 8), the third sampling period (Annex 6, Tables 4 and 9) and the final product (Annex 6, Tables 5 and 10). This aspect is important for the future use of the food wastes as a component for petfood, as small or moderate variations in the nutrient profile of the food wastes would allow for a better calculation of the nutrient composition in the end product. This aspect would be highly relevant for the formulation of diets for dogs and cats.

However, when the analyses were compared among the first three sampling periods (S1-S3), variations in the nutrient composition were statistically significant for almost all parameters (Annex 6, Tables 11 and 12). When the final product (FP) was compared with the samples obtained during the first three sampling periods (S1-S3), the same effect was observed (Annex 6, Tables 1 and 6; please see minimum and maximum values).

The drying temperature (35 °C, 45 °C, 55 °C and 65 °C) had also a moderate impact on the analyzed nutrient concentrations of the samples obtained during the first three sampling periods (S1-S3). Based on these results and a discussion with all project partners, it was decided to consider a low drying temperature in order to prevent negative effects on the product quality.

The results of the nutrient analyses by FUB are highly important for the future use of the food wastes as a component for petfood. The data indicate that each batch of the food wastes has to be carefully analyzed prior to the inclusion in a complete diet, in order to guarantee for a constant composition of the end product.

Further analyses are required to confirm these results. For data interpretation, it should also be considered, that sample sizes are small at the moment, requiring further data for proper statistical analysis. An ongoing analysis of the collected food waste is an important aspect of the project and the action B5. In particular, potential seasonal fluctuations in the composition of the food wastes should be characterized.

In addition to the nutrient analyses, extensive in vitro trials have been initiated at FUB to determine the nutrient digestibility of the feed (Pictures 6-8). However, due to the high fat content of the feed, the methods already established at the Institute have to be modified. This is an ongoing progress and expected to be completed within the next operational period. Therefore, no results of this part of the study can be presented at this point, but will probably be provided within the year 2019.

Picture 14. Laboratory at FUB. Samples for the in vitro-trials.

Picture 15. Laboratory at FUB. Incubator for the in vitro-trials.

Picture 16. Laboratory at FUB. Measurement of the nitrogen content of samples.

All actions carried out are presented in detail in the attached **Annex_6_Sub-Annex 6.1. Analysis of the produced feed_FUB**.

Activity B.5.2.: Production of complete diets for dogs and cats with varying amounts of feed

For the trials with the dogs and cats, an Animal Care and Use protocol has been submitted to the Ethics Committee in Berlin and has been accepted on August 13, 2018. Thus, the trials with the dogs and cats can start as soon as the dried food wastes have been provided and the diets have been produced. It is expected that the trials with the dogs and cats can start in spring/summer 2019 and will also be completed in 2019.

Activity B.5.3.: Additions and alterations in the pilot unit

During the reference period and due to all the delays occurred in the projects' progress any action has been done yet.

Deliverable Name Action B5	Foreseen date	Actual date
Complete chemical analysis of the produced feed, through the pet food industry perspective	10/2018	10/2019 Due to amendment request
Complete evaluation of the produced feed for pets	12/2018	12/2019 Due to amendment request
Economic evaluation of the produced feed, regarding pet food utilisation	12/2018	12/2019 Due to amendment request
Indicators of shortcomings of the production process, in relation to the product's use for pet food, and suggestion for improvements	12/2019	12/2020 Due to amendment request

Milestone Name Action B5	Foreseen date	Actual date
Initiating trials regarding F4F product utilisation as pet food	10/2017	10/2018
Completing trials regarding use as pet food or pet food component	10/2019	10/2020 Due to amendment request

6.1.6. Action B.6.: Products' Customer Survey, Technical Scale Up, Economical and Environmental Evaluation and Replicability and Transferability of the F4F Process

Foreseen start date: 01/01/2018	Actual start date: 01/01/2018
Foreseen end date: 31/12/2019	Actual (or anticipated) end date: 31/12/2020

Activity B.6.1.: Customer survey

The project's delays that have been occurred resulted in a delay in the advancement of this action. It was anticipated that this action to be delivered at the end of 2018. Now, it is anticipated that this sub-action would fully be delivered up to the first quarter of 2020. According to the new submitted extended timetable (in case of the approval of the submitted extension request) it is now anticipated that the customer survey regarding pet food (industry & owners) will be concluded at the end of the last quarter of 2019 and the customer survey regarding pigs and poultry (farmers & consumers) will be concluded at the end of the first quarter of 2020, after the completion of a full-scale operational period, as it is typically based on the full-scale operation of the pilot unit. Nevertheless, the preparation of the questionnaire (customer survey) has been completed and the distribution of the questionnaire has been initiated. No further delays are anticipated for the forthcoming operational periods of the project.

No deliverables for this reporting period in this sub-action.

Activity B.6.2.: Economical evaluation and business plan

Due to all the delays in the project's progress this action is also delayed. However, partners have already collected all the required data during this period for the development of the business plans and the economic evaluation. For the conclusion of this action it is crucial the final optimum operational period to be concluded. Deliverables for this action are now expected at the end of summer, 2020.

No deliverables for this reporting period in this sub-action.

Activity B.6.3.: Environmental evaluation

The objective of this sub-activity is to assess the environmental impact of the food waste transformation into feed and to identify its hotspots; thus possibilities will be identified to reduce the overall environmental impact of the project. The methodology that will be used to assess the environmental impact will be Life Cycle Assessment (LCA), which requires reliable information about the construction and operation of the Solar drying/ Pasteurisation Pilot Unit.

However, there is no reliable information yet about the various operational parameters of a typical full operation (i.e. energy consumption, water consumption etc.) of the pilot unit, as a full operation has not occurred due to the licensing and consequent start-up delays. Such information will be collected during the next operational period (April-October 2019). HUA has already collected all the required data referring to the **construction** of the Pilot Unit and will combine these with the operational data, which will be collected during April-October 2019 operational period.

According to the new submitted extended timetable (in case of the approval of the submitted extension request). It is now projected that the LCA will be completed in August 2020, instead of August 2019, as it had initially anticipated in the proposal.

Activity B.6.4.: Technical scale up, design and construction manuals

As it has been mentioned in previous sub-actions, due to the delays that have been occurred up to now in the project there are no deliverables in this sub-action. However, partners from TEIC have already collected all required data from the construction of the pilot unit and the first operational period of the project. Public tender is also being prepared by TEIC's personnel for hiring of an external contractor for the development of manuals. This tender is estimated to be concluded during summer, 2019. Now it is anticipated that in case of the approval of the submitted extension request for the project, deliverables for this sub-action are being expected after the conclusion of the last, optimum operational period.

No deliverables for this reporting period in this sub-action.

Activity B.6.5.: Operational manuals

Same as sub-action B.6.4.

No deliverables for this reporting period in this sub-action.

Deliverable Name Action B6	Foreseen date	Actual date
Customer survey regarding pet food (industry & owners)	12/2018	12/2019 Due to amendment request
Customer survey regarding pigs and poultry (farmers & consumers)	03/2019	03/2020 Due to amendment request
Technical manuals and designs of a full scale unit	08/2019	08/2020 Due to amendment request
Operational manuals of a full scale unit	12/2019	12/2020 Due to amendment request
LCA and environmental evaluation	08/2019	08/2020 Due to amendment request
Business plan of full scale unit	08/2019	08/2020 Due to amendment request

Milestone Name Action B6	Foreseen date	Actual date
Surveys initiated	03/2018	03/2019 Due to amendment request

6.1.7. Action B.7.: Completing, Incorporating and Evaluating the F4F Process as Part of the EU's Wastes Strategy and other Union Policies

Foreseen start date: 01/01/2018	Actual start date: 01/01/2018
Foreseen end date: 31/12/2019	Actual (or anticipated) end date: 31/12/2020

Activity B.7.1.: Alternative use of the produced feed

Up to now and for the reporting period partners from TEIC have collected all required data for the conduction of the relevant tender for hiring external group of experts for testing the produced feed in anaerobic test units. However, partners from TEIC have already conducted two different lab trials for the alternative use of the produced feed from the trials that were carried out the first period of the project, as the quantity of this product was limited. The first trial was anaerobic digestion in dry food wastes and the second one was anaerobic digestion in fresh food wastes. In the next two operational periods of the project partners from TEIC will conduct all tests in the pilot scale anaerobic digestions units of TEIC. Moreover, up to the start up of the next operational period the tender for testing the produced feed in gasification test units will be concluded.

In the first case, experiments were carried out for biogas production of a thermal dried mixture of food wastes in combination with sewage sludge and other agro-industrial wastes in anaerobic digestion units, so as to investigate the alternative use of the produced feed from the pilot unit of the LIFE-F4F project.

For these experiments, it was attempted the biogas production by co-digesting from sewage sludge (SS) with a dried mixture of food waste, cheese whey and olive mill wastewater (FCO). A series of laboratory (in TEIC facilities) experiments were performed in continuously-operating reactors at 37^{o}C, fed with thermal dried mixtures of FCO at concentrations of 3%, 5% and 7%. The overall process was designed with a hydraulic retention time (HRT) of 24 days.

It has been occurred that FCO addition on sewage sludge can boost biogas yields if the mixture exceeds 3% (v/v) concentration in the feed. Any further increase of 5% FCO causes a small increase in biogas production. The reactor treating the sewage sludge produced 287 ml CH_4/L reactor/d before the addition of FCO and 815 ml CH_4/L reactor/d (5% v/v in the feed). The extra FCO-COD added (7% FCO v/v) to the feed did not have a negative effect on reactor performance, but seemed to have the same results. In all cases, the estimated biodegradability of mixtures was over 80%, while the VS removal was 22% for the maximum biomethane production (5% v/v). Moreover, co-digestion with FCO improved biogas production by 1.2-2.7 times.

In the second case with the use of fresh food wastes, experiments were carried out for biogas production of a mixture of fresh food wastes in combination with sewage sludge in anaerobic digestion units, so as to investigate the alternative use of the produced feed from the pilot unit of the LIFE-F4F project. In order to investigate the effect of municipal solid waste composed of food waste in biogas production, anaerobic co-digestions of sewage sludge with food waste were carried out. Continuous experiments at 35^{o}C were carried, with only sewage sludge and with a mix of sewage sludge and food waste. The reactor treating the sewage sludge produced 230±29 ml/l/d biogas before the addition of food waste and 572±44 biogas after the addition of food waste (5% v/v in the feed). These results suggest that methane can be produced very efficiently by co-digesting sewage sludge and food waste.

Two type of influent feedstock were utilized: 100% sewage sludge (SS) and a 5% of food waste (FW) and 95% sewage sludge in order to investigate the biogas production of the food waste – sludge co-digestion. The continuous experiments were carried out in a 3L digester constructed from stainless steel. The digester was operated at 35^{o}C with a total feeding volume of 125ml daily and hydraulic retention time of 24 days. Feedstock was added four times daily (every 6 hours). Biogas was collected by displacement of water. Initially, the reactor was inoculated with anaerobic sludge originating from the Municipal Sewage Treatment Plant (MSTP) of the city of Heraklion. Also sewage sludge (feedstock) was primary sludge from MSTP. Food waste was obtained from restaurant of Technological Educational Institute of Crete, Heraklion. The initial feed was sewage sludge and the bioreactor was operated using this feed for 30 days. Food waste was then added to the feed so that the reactor was fed continuously with 95% sewage sludge and 5% food waste. The use of FW as co-substrate in the anaerobic digestion of SS presents a great improvement of the biogas yield so these organic residues is very promising.

More details concerning these trials are presented in **Annex_8_Sub-Annex 8.1. Alternative use of the produced feed.** Relevant deliverables for this sub-action are expected according to the updated timetable, which is estimated after the conclusion of the full optimum operational period of the project.

Activity B.7.2.: F4F process in relation to the wastes strategy

Food waste clearly impacts the environment, wherein all wasted or discarded products are deposited, and the human health, which can be affected by unsafe food as well as by the type of food waste management. Food waste is multilevel and multisectoral because different legislative and policy framework impact on it.

Animal residual flows are considered to be potentially dangerous for human and animal health. Thus, uses of animal by-products are restricted. Policy measures regarding this topic are taken mainly to eradicate or at least reduce the risk of transmission of spongiform encephalopathies (TSEs). To this end, a general ban was imposed on the use of Processed Animal Proteins (PAPs) in the feeding of both ruminants (e.g. cattle and sheep) and non-ruminant animals, including fish and other aquaculture animals. The use of kitchen waste as animal feed is also forbidden. Nevertheless, the synergy between the waste management (environmental policy) and the resources efficiency (sustainability policy) is an issue that the F4F project is addressing by default.

An inventory of EU legislation with major implications for food waste has been prepared by HUA. This will be presented in the first Report of this action, regarding the role of F4F in the wastes management strategy and how it should be implemented as part of zero wastes scheme (August 2020). The EU legislative acts in force in December 2018 have been identified and included in the inventory. Legislative acts have been traced from an extended literature review and experts' consultation. The EU legislative framework reflects the complexity of the food waste challenge. It has implications for the entire food chain—from farmers to consumers—involving several different interrelated sectors, such as local and regional authorities, households and consumers, the processing and hospitality industry, the retail supply chain, and businesses and institutions providing catering services. Such a complex issue is addressed and has implications of a different nature in several policy areas.

The potential role of the F4F process in the local waste management schemes, with particular reference to Circular Economy and "Zero Waste", will be assessed after the

completion of a full operational period of the pilot unit, as it is essentially based on its full-scale operation and reliable information obtained of the outcomes (i.e. feed quality, feed safe to use, etc.).

Activity B.7.3.: The F4F in the resources efficiency roadmap and policies

The circular economy is a model of action that can be applied in all sectors and is now considered the only solution to continue to exist and to prosper people and the environment. The roadmap to a resource-efficient Europe that cannot be achieved if a significant amount of resources continues to be lost in the absence of any food waste prevention strategy. While a zero-risk society is likely only a utopian objective, regulations to reduce and manage risks for consumers are imposed via measures that are sometimes strict. These measures try to ensure food safety to protect and improve public, animal, crop, and forest health. However, if rules are excessively strict, significant amounts of food waste can occur.

The inventory of EU legislation with major implications for food waste that has been prepared by HUA has identified the EU legislative acts in force in December 2018. The EU legislative framework reflects the complexity of the food waste challenge. It has implications for the entire food chain—from farmers to consumers—involving several different interrelated sectors, such as local and regional authorities, households and consumers, the processing and hospitality industry, the retail supply chain, and businesses and institutions providing catering services. Such a complex issue is addressed and has implications of a different nature in several policy areas.

The possible need for modifying and adapting EU legislation and policy (as they been identified) in order that processes as the F4F or of similar efficient use of food waste to be incorporated in resource efficiency concept, will be addressed after the completion of a full operational period of the pilot unit, as it is essentially based on the outcomes of full-scale operation of the pilot unit (quality of feed, potential use etc.).

Activity B.7.4.: Securing funding for operating the F4F unit

For this sub-action ESDAK has conducted a public tender for hiring a contractor for supporting ESDAK's permanent personnel. All actions during this tendering procedure are presented in detail in the following Table 12. In this sub-action all the legal activities and preparation of relevant supporting documents for the various Municipal City Councils are included, in order to support financially the operation of the pilot unit after the end of the F4F project or a full-scale unit.

This tender also includes supporting and in other sub-actions of the project. More specifically, the contractor from this tender has also to support ESDAK in Action B1 in contacts with hotels, in Action B2 supporting in the development of the required studies and tenders for the construction of the pilot unit, in Action B3 supporting in the tenders development for the food wastes from the hotels and the operation of the pilot unit, in Action B6 data collection from the construction and operation of the pilot unit and participation in the development of the business plan and economic evaluation.

Up to now, during this reference period all deliverables concerning Actions B1, B2 for the contractor of this tender have been concluded and presented in the Actions respectively. For the Action B3 is still pending the monitoring of the operation of the unit until the end of the final optimum operational period. For Actions B6 and B7 up to now partners are

collecting the data needed. Deliverables for these actions are estimated at the final report of the project. The relevant tender documents have been submitted with the 1st progress report.

Table 12. Tendering procedure for supporting ESDAK's permanent personnel in the development of the project's infrastructures.

SERVICE PROVISION: SUPPORT ESDAK FOR THE DEVELOPMENT OF INFRASTRUCTURES RELATED TO THE ACTIONS OF THE PROJECT LIFE F4F **Procurement according to the law 4412/2016**	**Date**
Primary request to the Financial Service of ESDAK for service provision «Support ESDAK for the development of infrastructures related to the actions of the project life F4F» (Protocol No. 1687/21-11-2016)	21/11/2016
Publication of Primary request to Central Electronic Registry of Public Contract (KHDMS) (KHDMS No: 16REQ005423462)	21/11/2016
Credit Acceptance (No. 122/2016 decision of ESDAK)	21/11/2016
Publication of Decision of ESDAK's Executive Committee (EC) –Acceptance of primary request (KHDMS No: 16REQ005480327)	30/11/2016
Acceptance to conduct the procurement (No. 122/2016 decision of ESDAK)	21/11/2016
Acceptance of the study and tender documents for service provision «Support ESDAK for the development of infrastructures related to the actions of the project life F4F» (No. 122/2016 decision of ESDAK)	21/11/2016
Committees constitution for the procurement «Support ESDAK for the development of infrastructures related to the actions of the project life F4F» (No. 134/2016 decision of ESDAK)	8/12/2016
Publication of the procurement to KHDMS (KHDMS No: 16PROC005499333)	2/12/2016
Publication of the procurement to diavgeia.gov.gr (ΑΔΑ: Ω1ΤΘΟΡ2Ω-Η6Ι)	2/12/2016
Deadline for offers submission	15/12/2016
Opening offers	15/12/2016
Acceptance of the decision of the Committee responsible for the procurement and publication of temporary bidder (No. 144/2016 decision of ESDAK)	23/12/2016
Invitation to submit the award recommendation documents (No. 2007/23-12-2016)	23/12/2016
Invitation to sign the contract (No. 2046/30-12-2016)	30/12/2016
Service contract «Support ESDAK for the development of infrastructures related to the actions of the project life F4F» (No. 102/18-1-2017)	18/1/2017
Publication of the contract to (KHDMS) (KHDMS No: 17SYMV005713886)	20/1/2017

Deliverable Name Action B7	**Foreseen date**	**Actual date**
Reports and suggestion regarding the role of F4F in the wastes management strategy and how it should be implemented as part of zero wastes scheme	08/2019	08/2020 Due to amendment request
Reports and suggestions regarding the incorporation of the F4F process in the resources efficiency road map and relevant required improvements in the legislation	10/2019	10/2020 Due to amendment request
Documents regarding the process towards funding the F4F unit through wastes' management municipal taxation	11/2019	11/2020 Due to amendment request
Data and complete evaluations regarding alternative uses of the F4F product	12/2019	12/2020 Due to amendment request

Milestone Name Action B7	Foreseen date	Actual date
Initiating biogas and gasification evaluation processes and trials	01/2018	01/2019 Due to amendment request

6.1.8. Action C.1.: Monitoring of the impact of the project actions

Foreseen start date: 01/07/2017	Actual start date: 01/07/2018
Foreseen end date: 29/02/2020	Actual (or anticipated) end date: 28/02/2021

Activity C.1.1.: Impact of the project's actions (excluding socio-economic)

For the implementation of this action, ESDAK hired a supporting external assistance, with the title "Support ESDAK in the management/monitoring of the project LIFE-F4F" a procurement according to law 4412/2016. The main object of this service is to support ESDAK's personnel in dissemination actions and in collecting data for project's reports. The public tender carried out on April, 2017 and the contract has been signed between ESDAK and the contractor on May, 25th 2017. All actions during this tendering procedure are presented in detail in the following Table 13. The supporting contractor will provide services for actions C1, D1 & E1 to ESDAK, up to the end of the project's progress. More specifically, the contractor is responsible in Action C1 for collecting data regarding of all performance indicators, estimations of hypothetical impacts, etc., in Action D1 for the development of all report documents and data regarding the overall dissemination activities, etc and in Action E1 for editing all partners' reports and file preparation. The relevant tender documents have been submitted with the 1st progress report.

On January, 2018 the submission of Key Performance Indicators for the LIFE-F4F project in the online KPI database was carried out.

Table 13. Tendering procedure for supporting ESDAK's permanent personnel in the management / monitoring of the F4F project

SERVICE PROVISION: SUPPORT ESDAK IN THE MANAGEMENT/MONITORING OF THE PROJECT LIFE F4F Procurement according to law 4412/2016	**Date**
Primary request to the Financial Service of ESDAK for service provision «Support ESDAK in the management/monitoring of the project life F4F» (No. 139/25-1-2017)	25/1/2017
Publication of Primary request to Central Electronic Registry of Public Contract (KHDMS) (KHDMS No: 17REQ005741463)	30/1/2017
Credit Acceptance (No. 25/2017 decision of ESDAK))	1/2/2017
Publication of Decision of ESDAK's Executive Committee (EC) –Acceptance of primary request (KHDMS No: 17REQ005765015)	6/2/2017
Acceptance to conduct the procurement (No. 44/2017 decision of ESDAK)	3/3/2017
Acceptance of the study and tender documents for service provision «Support ESDAK for the development of infrastructures related to the actions of the project life F4F» (No. 44/2017 decision of ESDAK)	3/3/2017
Committees constitution for the procurement «Support ESDAK for the development of infrastructures related to the actions of the project life F4F» (No. 44/2017 decision of ESDAK)	3/3/2017
Publication of the procurement to KHDMS (KHDMS No: 17PROC005951435)	21/3/2017
Publication of the procurement to diavgeia.gov.gr (No: 6ΔΒ2ΟΡ2Ω-ΚΝΙ)	21/3/2017
Deadline for offers submission	4/4/2017
Opening offers	4/4/2017
Acceptance of the decision (Document 1 & 2) of the Committee responsible for the procurement and publication of temporary bidder (αρ. 69/2017 decision of ESDAK)	25/4/2017

SERVICE PROVISION: SUPPORT ESDAK IN THE MANAGEMENT/MONITORING OF THE PROJECT LIFE F4F Procurement according to law 4412/2016	Date
Acceptance of the decision (Document 3) of the Committee responsible for the procurement (αρ. 79/2017 decision of ESDAK)	17/5/2017
Invitation to submit the award recommendation documents (Protocol No. 750/3-5-2017)	3/5/2017
Invitation to sign the contract (Protocol No 864/24-5-2017)	24-5-2017
Service contract «Support ESDAK in the management/monitoring of the project life F4F» (Protocol No 875/25-5-2017)	25/5/2017
Publication of the contract to (KHDMS) (KHDMS No: 17SYMV006257531)	30/5/2017

Activity C.1.2.: Impact of the full scale realisation of the process (excluding socio-economic)

Deliverables in this sub-action are expected at the end of the full scale operational period of the project.

Activity C.1.3.: Assessment of the project's socio-economic impact

The concept for this activity is the assessment of the projects' impact in a variety of areas as the local economy and population, during the projects pilot and possible full-scale implementation. In order to assess the socio-economic impact of the project, the Socioeconomic Life Cycle Assessment (S-LCA) methodology will be employed.

First data recording was expected during the construction of the pilot unit on November 2017. However, the buildings for sorting and grinding and the solar drying halls, which were expected to be delivered on May 2017, were finally delivered on June 2018. This delay resulted in that the full-scale operation of the pilot unit projected for April-October 2018, when data information about the construction and operation of the pilot unit would have been collected, to be delayed for a year.

As a result, the first version of S-LCA will be completed on February 2020, after the completion of a typical operational period of the pilot unit, as it is largely based on the full-scale operation of the pilot unit. It will be revised and finalised in February 2021. No further delays are anticipated for the forthcoming operational periods of the project.

No deliverables for this activity in this reporting period.

Deliverable Name Action C1	Foreseen date	Actual date
First evaluation of performance indicators	08/2017	01/2019
Assessment of the initial situation	09/2017	01/2019
Impacts of the project if a full scale unit will be developed	12/2018	12/2019 Due to amendment request
Qualitatively and quantitatively verification of the impact of the project actions during realisation	12/2018	12/2019 Due to amendment request
S-LCA completed	02/2018	02/2020 (1st version) 02/2021 (revised

Deliverable Name Action C1	Foreseen date	Actual date
		version) Due to amendment request
Mid-term evaluation of performance indicators	01/2019	01/2020 Due to amendment request
Final evaluation of performance indicators	02/2020	02/2021 Due to amendment request

Milestone Name Action C1	Foreseen date	Actual date
Initiating monitoring on project's impact of the project actions	09/2017	01/2019
Initiating the development of F4F process impacts, when fully realised	09/2018	09/2019 Due to amendment request

6.1.9. Action D.1.: Communication and dissemination actions

Foreseen start date: 01/09/2016	Actual start date: 01/09/2016
Foreseen end date: 29/02/2020	Actual (or anticipated) end date: 28/02/2021

Activity D.1.1.: Dissemination activities towards the general public

Concerning dissemination activities towards the general public, the following actions have been done during the reference period by partners:

- A tender for hiring (external assistance – dissemination consultant) a professional team of ESDAK's dissemination actions. The relevant contract has been signed on 17-01-2017. All data concern this have been submitted with the 1st progress report.

Project's website, including an e-forum & Social media accounts:

- The project's web-site, including e-forum, social media accounts (Facebook, twitter, YouTube), project's logo, a general project's banner, press releases to the local mass media. The web-site and all social media are regularly updated, due to project's progress and are presented in the project's web-site (https://life-f4f.gr/). All data concern this have been submitted with the 1st progress report.

Concerning the web-site, up to now there are more than 50 unique visitors, more than 80 visits and about 55 sec lasts each connection per visitor. In project's facebook account there are more than 230 followers. Partners the next period will try their best in order to increase the project's dissemination through the web-site and social media accounts.

Press conferences/releases:

All press releases and relevant broadcasting of the video in national TV for the project are presented in the LIFE-F4F web-site. More specifically, during the reporting period 7 press releases have been published concerning the PMB meetings and the monitoring visits. In total, during the reference period more than 15press releases have been presented in the project's site and in local printed and electronic press.

A short Leaflet:

- A short leaflet for the public (in Greek and in English) including information regarding the F4F project and the process combining has been developed by TEIC.

Picture 17. General leaflet for public _ EN

Picture 18. General leaflet for public _ GR

A series of informative events and open days:

In total partners have participated in the following informative events and open days during the reporting period.

1. The 1st open day event **organized** on November 24th, 2016 in Crete **by ESDAK**, in order hotel owners and local community to be informed about the F4F project. During this day representatives from Heraklion municipality and owners or representatives from Heraklion and Cherssonissos municipality participated and were informed about the project's main objectives. About 60 people were presented in this event.
2. **TEIC** has **organized** an informative event for the Creta Marris hotel personnel on April, 2017. During this day more than 200 people participated and were informed about the project and what has to be done for this in hotel's kitchens and restaurants. More details about this have been submitted with the 1st progress report
3. **Participation** by F4F project partners (ESDAK) with a presentation to the open day organized by the Region of Crete, concerning the seasonal waste fluctuation as a consequence of tourism. This open day was on October, 24th, 2017 in Heraklion, Crete and more that 50 people attend this event.
4. The president of **ESDAK** invited representatives from the project cooperating hotels in order to inform them about the distribution of the food waste collection bins in hotels, on Wednesday, 1st of November, 2017, at ESDAK's facilities. 10 people from the cooperative hotels participated in this event.
5. **Participation** by ESDAK in the 3rd Amari Green Festival on 23rd of July 2018. Ms Panteli presented the LIFE-F4F project.
6. A meeting was organized by the Heraklion Municipality, on 30th of July, 2018 at Heraklion Chamber. The main purpose of the meeting was the discussion about the rational biowaste management of the hospitality sector from the center of the Heraklion City. Representatives from ESDAK, Municipality of Heraklion, shopkeepers from the center of Heraklion City, from the chamber and Heraklion Commercial Association.
7. Harokopio University (**HUA**) actively promotes the concept of waste reduction by **organizing** a series of lectures, workshops and actions every year. On November,

2018 HUA organized an event where scientists, engineers and academics presented works on the prevention of food waste. More than 100 people attend this event.

All relevant data from these events (presentations, agenda, participant lists, photos) are presented in detail in **Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public**.

Open day events in the pilot unit aiming mostly in interested in the subject citizens and schools

1. **TEIC organized** an open day event on November 28th. About 70 students from TEIC visited the pilot unit and were informed about the F4F process

All relevant data from events and open days reported above (presentations, agenda, participant lists, and photos) are presented in detail in **Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public**.

Conferences/Workshops

In total project partners have participated in 9 conferences / workshops during this reference period.

1. The F4F project partners ESDAK & HUA participated in the 5th International Conference on Sustainable Solid Waste Management, in Athens, 21-24 of June, 2017, with a poster and a presentation, each.
2. ESDAK & HUA participated in the 15th International Conference on Environmental Science and Technology, in Rhodes, 31 August to 2 September 2017, with a poster and a presentation, each.
3. The LIFE F4F project was presented in the workshop on "Waste prevention", which was organised on 24/11/2017, by HUA, in the framework of the European Week for Waste Reduction, which carried out in Athens, on 20-24 of November, 2017.
4. The HUA team participated with a poster presentation entitled Food waste assessment in the hospitality sector: Preliminary results of the Food for Feed Project, in the 5th International Conference "Solid Waste Management and its Contribution to Circular Economy" organised by the Hellenic Solid Waste Management Association (HSWMA) in collaboration with International Solid Waste Association (ISWA) and took place in Athens, between 14 and 15 December 2017.
5. ESDAK participated in the Verde.Tec exhibition/conference, with main subject the "Environmental Technologies". The LIFE-F4F project participated in this conference with a presentation and won an award for the innovative technology that is used and the main project idea.
6. ESDAK organized a Conference on 29th & 30th of March, 2018 in Crete with subject "The Regional Solid Waste Management Plan - A Road to the Cyclical Economy". ESDAK & TEIC presented the LIFE-F4F project.

7. Partners' from TEIC participated in NAXOS2018 conference, on 13-16th of June, 2018 with a presentation. The HUA team participated in the NAXOS 2018 conference with a Poster Presentation.
8. The HUA team participated in the workshop ran by the European partners of the LIFE+ BIOHEC project as part of the second Annual Meeting of ECO Observatory in Athens, on Friday 29th of June 2018.
9. HUA participated in the 6th International Conference on Industrial & Hazardous Waste Management, that was carried out in Chania, on 4-7th of September, 2018.

Networking

1. Participation with the project's banner in the 25th Anniversary and Celebration Event of the LIFE Program, organized by the Green Fund and the Greek Life Task Force, on June, 2017.
2. Participation by ESDAK with a presentation for the LIFE-F4F project in an event organized by Greek LIFE Task Force – GR LTF on April, 26th, 2018 in Heraklion Crete with subject "Information Event for the European Financial Program LIFE".

A number of videos of the process are being presented in the projects web site aiming to the general public which probably ignores issues related with food wastes

More information about this sub-action is presented in **Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public**.

Activity D.1.2.: Dissemination activities towards professionals related with the F4F process

For the supporting of the dissemination activities towards professionals and industry related with the F4F process, a tender for hiring a professional team has been conducted by TEIC. This tender concerns open days in the pilot unit to investors, report and meetings about dissemination activities towards private entities, one International conference, Replicability and transferability activities reports, Professional BPLAN. Up to now any open day has been organized in the pilot unit where interested people/groups will be allowed to monitor the whole process of the project, organization of specific workshops as part of international conferences, professional and specific dissemination products, training courses regarding the process and other actions. More details about this tender are presented in **Annex_10_Sub-Annex_10.2. External assistance by TEIC**. The tendering procedure of this tender is presented in details on the Table 11 below.

Table 14. External assistance tendering procedure by TEIC

Procurement of external assistance for publicity of the project life F4F	
Request to the Management Committee of ELKE TEIC for the procurement of external assistance for publicity of the project life F4F. All relevant tender documents with technical information for the procurement of external assistance are included. (Request No 8654/12-12-2017).	27/12/2017
Acceptance of request / Appointment of the tender committee (Decision 784/27-12-2017)	7/12/2017
Publication of Decision of TEIC's Management Committee (EC) to Central Electronic Registry of Public Contract (KHMDS) (KHMDS No: 18REQ00309763)	15/05/2018
Publication of the tender (Protocol: 3898/15-05-2018)	15/05/2018
Publication of the tender to KHMDS (KHMDS No:18PROC003095590) and to	15/05/2018

Procurement of external assistance for publicity of the project life F4F	
Diavgeia.gov.gr (ADA: 7ΟΘ64691Ο3-XTX).	
Publication of the tender to the TEIC's portal	15/05/2018
Deadline for offers submission	12/06/2018
Opening supporting documentation and technical offer of the company "LIVING PROSPECTS & ANAPTIXIAKI LTD"	13/06/2018
Approval of the evaluation of the offer by committee (Decision 809/31ο/25-07-2018 of Management Committee of ELKE of TEIC)	25/07/2018
Opening and evaluation of the economical offer of the company "LIVING PROSPECTS & ANAPTIXIAKI LTD"	07/09/2018
Approval of the evaluation of the economical offer (Decision 815/3ο/26-09-2018 of Management Committee of ELKE of TEIC)	26/09/2018
Opening documentation for contract of the company "LIVING PROSPECTS & ANAPTIXIAKI LTD"	25/10/2018
Approval by committee (Decision 823/19ο/21-11-2018 of Management Committee of ELKE of TEIC)	21/11/2018
Publication of the Decision of signing contract to KHMDS (19AWRD004428192)and to Diavgeia.gov.gr (ADA: ΩΦΛΟ4691Ο3-IM5)	07/02/2019

Activity D.1.3.: Dissemination activities towards the academia and consultants

An international conference has to be organized in this sub-action by TEIC. This is estimated probably at the end of the second full scale optimum operational period, so as results of the overall project to be presented by all partners. This is estimated at the end of 2020 or January, 2021, due to the approval of the extension amendment.

However, during the reporting period, partners have already participated in international conferences. More specifically, they have participated in the following conferences:

1. The F4F project partners ESDAK & HUA participated in the 5th International Conference on Sustainable Solid Waste Management, in Athens, 21-24 of June, 2017, with a poster and a presentation, each.
2. ESDAK & HUA participated in the 15th International Conference on Environmental Science and Technology, in Rhodes, 31 August to 2 September 2017, with a poster and a presentation, each.
3. ESDAK organized a Conference on 29th & 30th of March, 2018 in Crete with subject "The Regional Solid Waste Management Plan - A Road to the Cyclical Economy". ESDAK & TEIC presented the LIFE-F4F project.
4. 6th International Conference on Sustainable Solid Waste Management - NAXOS2018, which was held on 13-16th of June, 2018. Partners from TEIC participated with a presentation of the LIFE-F4F project. The HUA team participated with a Poster Presentation entitled "Food for Feed: An innovative process for transforming hotels' food waste into animal feed".
5. In September 2018, Professor Lasaridi, main representative from HUA team presented an oral presentation entitled "Characterisation and Quantification of Food Waste from Greek hotels" in the 6th International Conference on Industrial & Hazardous Waste Management – Crete 2018.

During this reference period of the project, no publication has been produced by partners. This is estimated to be done mainly after results that will occur from the full scale operational period and from the second, optimum full scale operational period of the project. Any conference has been organized by partners up to now. It is estimated that

after the conclusion of the optimum full operational period of the pilot unit partners will organize an international conference where they will present all data and results from the concluded F4F project.

More details about the partners' participation at these dissemination actions are presenting in **Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public,** where there also presented the abstracts, presentations, photos, etc.

Activity D.1.4.: Layman's report and notice boards

The Layman's report is going to be submitted by partners after the conclusion of the second full scale operational period of the project. Notice boards with basic information about the project, as well as the LIFE and the F4F logos have been placed at strategic places, not only in the pilot unit, but also at places accessible to the public in the participating organizations as well as publicity accessible points of interest. All partners have also informative boards of the project at their facilities.

The notice boards of the unit have also been developed by ESDAK. Two notice boards (100X150cm) for the pilot unit and 20 notice boards (21X297cm) for the unit, partners and participating organizations. All these notice boards have been erected and are being exhibited. More details are presented in annex **Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public**.

Picture 19. Notice boards in the pilot unit

In the pilot unit

In the pilot unit

Picture 20. Project's notice boards

Picture 21. Cooperative with the LIFE-F4F organizations

More details about notice boards are presented in **Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public**.

Activity D.1.5.: Networking

In the context of networking, the F4F project has participated in the following open days:

1. 25th year celebration of EU supporting Nature, Environment & Climate Action through LIFE, in Athens, 18th of May, 2017 with a banner (Greek LIFE Task Force)
2. Organization by Greek LIFE Task Force – GR LTF an open day on April, 26th, in Heraklion Crete with subject "Information Event for the European Financial Program LIFE". ESDAK also presented the LIFE-F4F project.
3. Participation and networking in LIFE FOOD WASTE PLATFORM MEETING. The LIFE food waste platform meeting, 'Effective Solutions for Prevention and Treatment', took place in Budapest on 8-9 October 2018. The event was hosted by the National Food Chain Safety Office (NFCSO), Hungary under the auspices of the LIFE15 GIE/HU/001048 – LIFEFOODWASTEPREV).

More details about these dissemination actions are presented in **Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public**. Moreover, links with other connected projects to the LIFE-F4F project are being presented in the project's web-site (https://life-f4f.gr/).

Activity D.1.6.: Dissemination activities towards private entities

Partners have already started to collect data for this activity. More specifically, first lists of animal feed producing industries in the country and animal farmers in Crete have been filled in. Partners will go on with updating these lists, in order the next period to be concluded.

Deliverable Name Action D1	Foreseen date	Actual date
Website and social media accounts	12/2016	01/2017 Concluded
Notice boards	08/2017	04/2018 Concluded
Leaflet and newsletter for the benefits and need of source separation in households, aiming for the general public	12/2018	12/2019 Due to amendment request
General public leaflet	12/2018	12/2019 Due to amendment request
Replicability and transferability activities report	12/2019	12/2020 Due to amendment request
Networking report	12/2019	12/2020 Due to amendment request
Report about dissemination activities towards private entities	12/2019	12/2020 Due to amendment request
Open day events	10/2019	02/2021 Due to amendment request
International conference	10/2019	02/2021 Due to amendment request
Publication of academic papers	02/2020	02/2021 Due to amendment request
Layman's report	02/2020	02/2021 Due to amendment request

Milestone Name Action D1	Foreseen date	Actual date
Hiring professional group for focused dissemination activities	01/2017	01/2017
Initialising dissemination activities related with the pilot unit	08/2018	08/2019 Due to amendment request
Lists of private entities	08/2018	08/2019 Due to amendment request
Initialising professional meetings aiming to a full scale unit	01/2019	01/2020 Due to amendment request

6.1.10. Action E.1.: Project management and monitoring of the project progress

Foreseen start date: 01/09/2016	Actual start date: 01/09/2016
Foreseen end date: 29/02/2020	Actual (or anticipated) end date: 28/02/2021

During this reporting period, following το the Grant Agreement signature with the EC (June 17th 2016) and the Partnership agreements between the Coordinating Beneficiary & the Associate Beneficiaries (these agreements have been attached with the 1st progress report), the project is ongoing and the following meetings (technical and management) have been organized by partners:

1. The Kick-off meeting took place in Crete, by ESDAK, on September 30th 2016, where representatives of all project partners participated. All scheduled activities were planned and tasks were allocated to each responsible beneficiary. The internal communication procedures of the consortium were also set.
2. Before the Kick off meeting, the 1st partners meeting carried out on September 29th, 2016, by ESDAK (this is on time, as foreseen).
3. The 2nd partners' meeting realized by HUA in Athens, on April, 6-7th 2017 with the participation of the partners from Greece. More specifically, project partners discussed the project's progress by action, LIFE+ Common Provisions, Project management and financial aspects for future activities. The team resolved some technical issues, public tendering procedure, and financial issues.
4. The 3rd partners' meeting was organized by ESDAK in Crete, on 29th of June, 2017. All Greek partners participated. Project progress by partners, financial issues, next steps, monitoring visit (discussion & preparation) were discussed during this meeting.
5. The 1st monitoring visit was carried out in Crete, on 30th of June, 2017 organized by ESDAK. All partners participated in this meeting. The monitoring expert was Mr Demian.
6. The 2nd monitoring visit was carried out on 21st and 22nd of June 2018, in Crete, organized by ESDAK. The monitoring expert of the project Mrs Marouli Christina, visited the pilot unit of the project and had a meeting with all project partners at ESDAK office.
7. The 4th partners' meeting realized by TEIC in Crete, on 24th and 25th of September, 2018. All partners participated. Project progress by partners, financial issues, first results and problems faced and next steps were discussed during this meeting.

The meeting agenda, the participants list, photos of the meeting, the presentation and the minutes of all meetings mentioned above are attached in **Annex_11_Sub-Annex_11.1. Partners meetings**.

Beside these meetings, frequent communication between the PMB and project team members was carried out via e-mails and phone calls. Project team members, with the assistance of the PMB & PMT are in collaboration as well as with all stakeholders relevant to the project implementation, in order to ensure that the project will eventually reach its objectives.

The project manager, Mrs Panteli until now has successfully coordinated the technical activities of the project and she is discussing all project issues and problems that have been arisen during the project progress with all partners via Skype meetings and with internal meetings with ESDAK and TEIC personnel, as these two partners are in Crete and during this period they were mostly involved in the project's progress. The project

manager also when necessary informs the Commission and the PMB for issues occur. All partners are informed with every detail about the project progress.

As it has been described in the project's proposal, during the project's duration seven (7) meetings of the PMB should be organized. Up to now, three (3) PMB meetings have been organized in Crete and one in Athens. In Crete, two partners meetings have been organized by ESDAK, The first on 29th of September 2016 (1st partners' meeting) and the second one on 29th of June, 2017 (3rd partners meeting). Partners from TEIC organized in Heraklion the 4th partners meeting, on 24th to 25th of September, 2018. The 2nd partners' meeting was organized by HUA in Athens, on 6th to 7th of April, 2017. Up to now, all these meetings have been organized by partners about every six (6) months as foreseen. Still are pending one PMB meeting in Athens by AUA, one organized by ESDAK in Crete and one meeting in Berlin, by FUB. However, it is expected that, in case of approval of the extension request, more meetings will have to be organized in Crete by ESDAK and TEIC.

Additionally, as it has mentioned in the 1st progress report, the PMB, via the main contribution of the project manager established the procedures, not only for technical, but also for the financial management of the project, such as:

- Establishment of the timesheets to monitor the personnel work.
- Collaboration with the financial departments of all partners in order to clarify and set the project's financial requirements.

All relevant documents concerning the meetings presented above are attached in **Annex_11_Sub-Annex_11.1. Partners meetings.**

Activity E.1.1.: Reporting to the EC

During this reporting period, the following reports have been submitted to the monitoring team and to EC:

1. 1st progress report of the project LIFE-F4F. Submitted on 09/2017, with reference period from 01/09/2016 to 31/07/2017. This was on time, as foreseen.
2. An Amendment request for the project extension for twelve months. Submitted on 29th of January, 2019.
3. This is the Mid –term report of the project LIFE-F4F. Submitted on 28/02/2019 (28 months from the project start up), with reference period from 01/09/2016 to 31/01/2019. This is delayed by 1 month, as it was to be submitted on 31/1/2019. However, partners submitted on 31st of January, 2019 a letter to EC for one month extension of the mid term report submission. The request for this extension was approved by Ms Lamhandaz, on 6th of February, 2019. Partners have already spent more than 100% of their first pre-financing payment.
4. The final report of the project LIFE-F4F, due to the approved Grant Agreement is expected at the end of the project. However, in case of approval of the project extension due to the submitted amendment request, the final report will be submitted a year later and in this case, among the mid-term report and the final report, another progress report will be submitted, at about 18 months after the mid-term report.

Activity E.1.2.: Use of external experts for evaluating progress

No progress during the reporting period in this activity.

During the reporting period, partners have contact with external experts to organize a deputation in order to evaluate the project's progress. All these experts have relevant experience with LIFE projects related to the project's main object. This deputy is estimated to be invited by partners during the second operational period of the pilot unit in order to evaluate the procedure, the short coming delays or problems or alternatives that have taken place during the project's progress. All these will be discussed so as to help partners to optimize the progress of the project.

In the Table below, a list with the names of the experts involved in this external deputation is presented.

Table 15. External Expert Deputy

Proposed by partner	External Expert Deputy Name of person	Stake holder	Position
ESDAK	Paterakis K.	DEDISA SA	Management Director on Recycling and Composting Engineering - General Director of DEI.SA. SA
ESDAK	Charitopoulou T.	EOAN	Director of alternative management
TEIC	Kornaros M.	University of Patra	Associate Professor Department of chemical engineers
HUA	Tavoularis G.	ENVIROPLAN SA	Team Leader – Expert in Waste Management Systems EuropeAid (Georgia)
AUA	Sotiropoulos A.	TERANOVA	Project Manager of EU Projects

Activity E.1.3.: Auditing

An external independent auditor for the project will be set by ESDAK before the end of the project which is expected on February, 2021, in case of approval of the submitted amendment request, for the submission of the auditing report on May, 2021.

Activity E.1.4.: After LIFE+ communication plan

A coherent to the project's dissemination plan report will be submitted with the project's final report.

Deliverable Name Action E1	Foreseen date	Actual date
1st progress report	08/2017	09/2017 Concluded
Mid-term report	01/2019	01/2019
2nd progress report		04/2020
Final report	05/2020	05/2021 Due to amendment request

Milestone Name Action E1	Foreseen date	Actual date
First meeting of the management board	01/2017	09/2016 Concluded
1st progress report submission	08/2017	09/2017 Concluded
Mid-term report submission	01/2019	01/2019

Milestone Name Action E1	Foreseen date	Actual date
		Concluded
2nd progress report submission		04/2020
Final report submission	05/2020	05/2021 Due to amendment request

6.2. Main deviations, problems and corrective actions implemented

The main problem encountered in the project's duration was at first the delays occurred in the licensing procedure for the official approval start up of the pilot unit construction in the selected parcel. The final selected area was within the boundaries of the bio-drying unit of Heraklion Municipality, where waste management procedures are permitted and all this area is accordingly licensed. This was a five (5) month delay for the project's progress, as it was foreseen until 02/2017 and finally it was concluded on 07/2017. Due to this delay and after the licensing procedure approval for the development of the pilot unit, partners from ESDAK and TEIC started all legal procedures, in accordance with Greek Legislation, so as to carry out all the required tendering procedures. These procedures started by partners after the licensing approval (07/2017), as it was not possible any tender to be published if the selected area (land) was not officially licensed by Greek authorities. At first, ESDAK had to publish the tender for the pilot unit construction and TEIC had to publish the tenders for the turners' construction. No delay occurred during these publishing procedures by the two beneficiaries, however, the tender for the construction lasted from the end of July, 2017 (exactly after the licensing procedure approval) until the first days of February, 2018 (about after six months), when the relevant contract was signed. The contractor had to complete the construction within 45 days. Nevertheless, the contractor faced some difficulties and asked for contract extension for 45 days. Finally, the pilot unit was completed and delivered on May, 2018. The building for sorting and grinding and the solar drying halls were foreseen to be delivered on May, 2017 and finally, the unit was delivered on May, 2018 with a 12 month delay. The full operational solar drying pilot unit was foreseen on July, 2017 and the official acceptance of the unit from ESDAK finally was held at the first days of July, 2018. This is a 12 month delay of the project.

As it concerns the construction of the turners by TEIC, three tenders were finally published (as described in detail, in Action B.2. of this report). Tendering procedure actions for the turners construction started by TEI on September, 2017. The procedure for these tenders concluded on December, 2017 for consumables and on March, for equipment and external assistance. These tendering procedures were coincided with TEIC official elections vote for Rector and Vice Rectors, which are carried out every four years. During this election period, on December the new Rector and the Vice Rectors were elected; however, any official document couldn't be signed until the new rector to be officially declared as the main representative of the Institute. This procedure lasted for about three months, due to bureaucracy. This delay affects the tendering procedures, causing a corresponding delay. The solar drying turners were foreseen to be delivered on June, 2017 and finally they were delivered with a twelve month delay, on June 2018.

Despite the delays that occurred in both beneficiaries, concerning the construction and the full operation of the pilot unit, these delays caused a total delay of twelve months in total in the projects progress. This delay had as a result the initial operational period of the project to start with a twelve month delay. Due to this delay the project seems unlikely to stay behind schedule and in order the project's objectives to be viable the project needs a twelve (12) month extension, so as all deliverables to be concluded as foreseen.

6.3. Evaluation of Project Implementation

Concerning the evaluation of the project implementation:

- Methodology applied: During this reference period and due to up to now project's progress, at first all partners have followed the methodology as it has been described in the approved Grant Agreement, without any deviations. This concerns, beyond administrative part, the operational procedure, the collection system, the pre-treatment and the solar drying procedure of the production process. However, during this first operational period, all partners have located some problems and deviations / alterations in the project's process have been proposed in order optimizations to be occurred. These deviations / alterations in the proposed methodology are the following:
  - Refrigerators in all hotels are required. For the better conservation conditions of the food wastes and the better quality of the final product.
  - Additional equipment after grinding (Archimedes screw at first and maybe a pulverizer will be needed). The Archimedes screw has already been bought and placed in the unit at the end of June).
  - Different material for the interior covering of the drying halls (not inox). This will be taken into account by partners to the full scale unit.
  - Additional equipment in the floor heating system (heating pump). Partners will take care to supply the floor heating system, probably during the next period, with a heating pump. At first they will try to have some tests without it.
  - Optimization of the solar drying turners. They will be checked during this period and optimization actions will take place.
  - Smaller solar drying halls (or separation in appartments). Partners have checked during the initial period the drying rate, according to the selected quantities and the available solar drying halls in order to better develop the solar drying surface per product batch.
  - Lower height greenhouse. The height of the greenhouse should be lower for energy save and better exploitation of the solar energy. This will be taken into account for the full scale unit.
  - Additional insect's protection (air curtain). After the conclusion of the initial operational period and in order partners to face problems during the project from the presence of flies, they intent to buy for all entrances in the pilot unit air curtains.
  - Additional thermal drying of the end product. In order to achieve pasteurization of the end product, partners have already investigated for a purchase of a thermal dryer, for the next operational period. More specifically, they will try to reduce the product's moisture from 70-75% to 30% using the solar drying and the product with 30% moisture will be thermal drying in order to faster decrease the drying rate, to adjust the temperature level and at the same time to achieve pasteurization of the end product at 90^{o}C.
  - Use of organic acids as preservatives. The strategy of product drying using energy-efficient solar-dependent processes is a very valid strategy and represents a significant advance in the energy-efficient drying of foodstuffs. Due to the basic conditions, which require relatively long drying times, we would recommend the use of organic acids

In order partners to be able to meet the needs of these minor technical changes due to optimization of the pilot unit operation, made some minor budget transfers per budget category which does not overcomes the limit of 20% of the overall eligible cost. More details concerning these minor budget shifts are presented in Annex 12. Minor budget shifts.

More details about these partners' actions are also presented in **Annex_4_Sub-annex_4.2. Initial operational period of the present report**.

– Comparing the results achieved against the objectives and expected results foreseen in the proposal, the following are presented in brief per action:

Action	Foreseen in the revised proposal	Achieved	Evaluation
ACTION B.1.: Development of the Source Separated Food Waste Collection System	**Objectives:** To combine the expertise of the F4F partners on food waste management and the existing food waste management practices within the hospitality sector, in order to formulate an effective source separated food waste collection system and estimate, in accuracy, its full scale implementation cost. Ultimately, the abovementioned system will be the platform for the prompt implementation of the project. **Expected results:** 1. List of targeted and selected hotels and their operational characteristics 2. Selected hotels for the needs of the F4F project cooperation agreements signed 3. Selected hotels source separation system qualitatively & quantitative survey 4. Short listed and selected hotels optimum collection routes 5. Food wastes collection cost estimation system	Up to now partners have achieved to develop an effective source separation system in combination with an effective food waste collection system from the cooperative with the project hotels. A list of targeted and selected hotels with their characteristics has been completed, the relevant cooperation agreements with the selected hotels have been signed and the source separation system qualitatively & quantitatively survey has been completed. In addition, the selected hotels optimal collection routes have also been completed. An initial estimation of the food waste collection cost system has been completed. It will be monitored and revised until the end of the project.	This action has been completed as foreseen to the Grant Agreement. A quantitative and qualitative characterisation of the targeted hotels has been achieved. A source separation system for the collection of the participating hotels' food waste is setup and it is operational. Optimal collection routes have been identified and the collection cost per tonne has been estimated.
ACTION B.2.: Developing the F4F Pilot Unit	**Objectives:** All required activities and works, needed for the development of the F4F pilot unit where the separately collected food wastes will be hand sorted, shredded and then solar dried / pasteurized in the shortest possible period, towards the production of feed. **Expected results:** 1. All licenses for the development of the pilot unit 2. The building for sorting and grinding and the solar drying halls 3. The full operational solar drying pilot unit 4. The solar drying turners and various other equipment	This action has been fully completed, as the project's pilot unit has been completed and is fully operational.	This action has been concluded as foreseen to the Grant Agreement. No main technical changes have been arising and the first product from the pilot unit has been produced during the initial operational period. During this period partners intervene in the production procedure so as to optimize this procedure. Operational optimization suggestions from partners aim to the optimum operation of the

			unit for the second full scale period of the project.
ACTION B.3.: Initiating, Operating and Optimizing the F4F System	**Objectives:** The operation of the F4F system, under real conditions, aiming to determine the operational parameters including performance and operational costs, as well as to identify possible short comings, problems, limitations and required technical additions or improvements to the original idea and set up. The operation of the F4F process includes collection and treatment, where evaluation will take place in other actions (B5 and B6) **Expected results:** 1. Data, results and feed produced, during the initiating operational period 2. Data, results and feed produced, during the first full scale operational period 3. Optimum operational mode 4. Data, results and feed produced, during the optimum operational period 5. Data, results and biodiesel produced during project	Up to now, the first operational period of the project has been concluded. Until the end of the project the full scale and the optimum operational periods will be concluded as foreseen.	
ACTION B.4.: Evaluating the Produced Feed for Pigs and Poultry Husbandry	**Objectives:** To determine the quality of the produced feed, through a range of analysis and trials, in an effort to estimate the possible deviation of the product from the quality standards required for feeding productive animals as pigs and poultry (chickens), how this gap can be bridged and with which technology addition / alteration and finally the real economic value of the product **Expected results:** 1. Complete chemical analysis of the produced feed, through the pigs and poultry husbandry perspective 2. Indications of shortcomings of the production process, in relation to the product's use for pigs and poultry husbandry, and suggestion for improvements. 3. Economic evaluation of the produced feed, regarding pigs and poultry husbandry 4. Complete evaluation of the produced feed for pigs and poultry husbandry	The chemical analysis of the samples was performed for dry matter (DM), crude protein (CP), ether extracts (EE), ash and crude fiber (CF). The difference among the samples was their drying temperature (T) (T=35oC, T=45oC, T=55oC, T=65oC). The mycotoxins' level of the dry samples was also determined to be sure that there is no contamination during the whole process (from collection to sampling for testing and use).	Despite the variability among samples, the drying temperature has no effect on the samples chemical composition. The observed variability is rather expected since there is variability in the raw material for drying. If the total amount of each batch will be grinded and mixed properly, then the outcome will be homogeneous with lower variability. No great variability exists among the samples as the individual carbohydrates

			content is concerned. There are no significant differences among the samples, also due to the same reasons explained before the samples' chemical composition. No mycotoxin's contamination was found in the examined samples. The overall objective of the analyses was to be decided the optimal drying conditions (temperature/duration of the drying process) which should be applied in the material (waste) at the operation unit.
ACTION B.5.: Evaluating the Produced Feed as Pet Food	**Objectives:** The key objective of this work package is to evaluate the inclusion of the F4F product as an ingredient in pet food with regard to feed hygiene, feed acceptance, nutrient digestibility, animal welfare and public acceptance, and to determine its optimum inclusion level for nutritional and economic reasons. The *specific objectives are:* To evaluate the hygienic quality and nutrient composition of the feed To produce complete diets for dogs and cats with varying amounts of the feed To investigate the digestibility of the feed in vitro- and in vivo-trials with dogs and cats To determine the effects of varying amounts of F4F feed in a complete diet on feed acceptance, feed intake, body weight and fecal microbiome and metabolome in dogs and cats To calculate the costs for the production of the diets with or without the F4F feed (economic evaluation) **Expected results:**	In total, 37 samples of food wastes have been analyzed by FUB. In addition to the nutrient analyses, extensive in vitro trials have been initiated at FUB to determine the nutrient digestibility of the feed. For the trials with the dogs and cats, an Animal Care and Use protocol has been submitted to the Ethics Committee in Berlin and has been accepted on August 13, 2018.	The final product that will be used for the trials with the dogs and cats has been analyzed. Therefore, the trials with the dogs and cats can start within the next operational period. It is expected that these trials will start in spring/summer 2019 and will also be completed in 2019. For data interpretation, it should be considered, that sample sizes are small at the moment, requiring further data for proper statistical analysis. An ongoing analysis of the

	1. Complete chemical analysis of the produced feed, through the pet food industry perspective 2. Complete evaluation of the produced feed for pets 3. Economic evaluation of the produced feed, regarding pet food utilisation 4. Indicators of shortcomings of the production process, in relation to the product's use for pet food, and suggestion for improvements		collected food waste is an important aspect of the project and the action B5. Due to the high fat content of the feed, the in vitro-methods already established at the Institute have to be modified. This is an ongoing progress and expected to be completed within the next operational period.
ACTION B.6.: Products' Customer Survey, Technical Scale Up, Economical and Environmental Evaluation and Replicability and Transferability of the F4F Process	**Objectives:** All actions that will help the implementation of the F4F process into a full scale unit, either in the general area of the pilot unit and the direct involvement of the project's members or in other areas, through strong support of replicability and transferability actions **Expected results:** 1. Customer survey regarding pet food (industry & owners) 2. Customer survey regarding pigs and poultry (farmers & consumers) 3. Technical manuals and designs of a full scale unit 4. Operational manuals of a full scale unit 5. LCA and environmental evaluation 6. Business plan of full scale unit	During the reference period of the project, partners have collected required data for the development of all the required manuals of a full scale unit, for the LCA evaluation and for the business plan of a full scale unit. However, until the end of the project partners have to collect data from the next two operational periods so as to be able to conclude all the deliverables of this action and the expected results to arise. With regard to the customer survey, the preparation of the questionnaire has been completed and the distribution of the questionnaire has been initiated.	Important data from the pilot unit construction have already been collected for the development of this action's expected results.
ACTION B.7.: Completing, Incorporating and Evaluating the F4F Process as Part of the EU's Wastes Strategy and other Union Policies	**Objectives:** Conducting a number of versatile activities that will allow the evaluation of the F4F potential as part of the Wastes Strategy of the EU, as well as other Union policies and especially of the Resources Efficiency Roadmap. This evaluation will help identify and tackle potential problems and short comings (for example legislation issues) that could create significant issues towards the full scale realisation of the process, as well as, the replicability and transferability potential. **Expected results:** 1. Reports and suggestion regarding the role of F4F in the wastes	The role of the F4F process is under investigation, firstly in relation to the waste management strategy (zero waste scheme) and secondly the inclusion of the F4F process in the resources efficiency road map. Concerning the alternative use of the F4F product TEIC has already carried out trials during the initial operating period using the collected from the cooperative hotels food waste in anaerobic digestion.	An inventory of EU legislation with major implications for food waste has been prepared by HUA. The EU legislative acts in force in December 2018 have been identified and included in the inventory. Legislative acts have been traced from an extended literature review and

	management strategy and how it should be implemented as part of zero wastes scheme 2. Reports and suggestions regarding the incorporation of the F4F process in the resources efficiency road map and relevant required improvements in the legislation 3. Documents regarding the process towards funding the F4F unit through wastes' management municipal taxation 4. Data and complete evaluations regarding alternative uses of the F4F product		experts' consultation. Using the food wastes in anaerobic digestion can be used with good results
ACTION C.1.: Monitoring of the impact of the project actions	**Objectives:** The concept for this Action is the assessment of the impact of the project's realisation in a variety of parameters including the socio-economic impact to the local economy and population, during the projects pilot and possible full scale implementation **Expected results:** 1. First evaluation of performance indicators 2. Assessment of the initial situation 3. Impacts of the project if a full scale unit will be developed 4. Qualitatively and quantitatively verification of the impact of the project actions during realisation 5. S-LCA completed 6. Mid-term evaluation of performance indicators 7. Final evaluation of performance indicators	During the reference period partners have been collaborated so as to collect all data needed for the evaluation of the indicators in every stage of the project's unit operation, from the beginning till the end of the F4F project.	Due to licensing and consequent start-up delays, there is a lack of reliable information about the operational characteristics of the F4F process, resulted in a delay for evaluation of the projects impact, that it will be collected during the next operational period (April-October 2019). The Solar drying/ Pasteurisation Pilot Unit has successfully been constructed and already operated on a trial basis, and no further delays are anticipated for the forthcoming operational periods.
ACTION D.1.: Communication and dissemination actions	**Objectives:** The dissemination of the F4F process aiming in increasing the public's awareness and understanding, helping its replicability and transferability in other areas in Greece, the EU and the globe, and informing the academic community and research organisations on the benefits of the process, especially through networking. A mixed process regarding the dissemination will be followed during this Activity	Up to the submission of this Mid term Report the projects website and social media accounts have been developed. Notice boards have been displayed at strategic places accessible to the public in the participating organizations as well as publicly accessible points of interest of partners' installations. One leaflet in Greek	

	Expected results: 1. Website and social media accounts 2. Notice boards 3. Leaflet and newsletter for the benefits and need of source separation in households, aiming for the general public 4. General public leaflet 5. Replicability and transferability activities report 6. Networking report 7. Report about dissemination activities towards private entities 8. Open day events 9. International conference 10. Publication of academic papers 11. Layman's report	and in English has been developed for the general public, containing main information about the project and the pilot unit. Partners have participated in international conferences and have organized 2 open day events. One at the project's beginning so as local authorities and interested parties to be informed about the project and one for schools in the pilot unit. Partners, during the first operational period are collecting data in order to be able to develop an academic paper for publication.	
ACTION E.1.: Project management and monitoring of the project progress	**Objectives:** The overall management of the project and the effective reporting of the project's findings and progress to the EC. The successful completion of the F4F project requires well-planned coordination efforts for the management and financial control of the various activities. The main tasks of this action are to: • Provide the appropriate coordination of the project; • Secure smooth information flow to the EC and among the project's partners; • Perform financial control and auditing; • Produce progress and reports. **Expected results:** 1. 1st progress report 2. Mid-term report 3. Final report	The first project report has been submitted on 31/07/2017. An amendment request for a twelve months extension of the project has also been submitted on 29th of January, 2019. This is the submission of the mid term report, submitted on February, 2019. The next report which is expected to be submitted is the final report, after the project's completion.	

- The main project's result from the start up of the operation of the pilot unit was the high purity of the collected food wastes. More specifically, from the composition analysis that carried out during the initial operation period the purity of the food wastes was about 99%. This confirms the initial hypothesis which is mention in the project's proposal that cooperation with four and five stars hotels which manage their food wastes separately, due to HACCP and ISO regulations will lead to better results. The application of these regulations in the cooperative hotels has as a result a high purity of the selected wastes, which helps the hand-sorting procedure in the pre-treatment unit and moreover, leads to a high quality end product. However, from the up to now operation of the pilot unit of the F4F project it is not clear to partners the operation cost of this procedure. This will become apparent at the end of the project and after the completion of the optimum operational period.
- An amendment request has been submitted on 29th of January, 2019 by partners, so as to be able to face the up to now delays that have been occurred during the project's progress. It is anticipated that in case of the approval of the submitted amendment request which concerns a 12 month extension of the project, the project's main objectives and the work plan, as it has been described in the proposal, is expected to be viable and to close successfully.
- Concerning replication efforts, up to now an external contractor has been hired by TEIC and results will be occurred at the end of the project.
- The effectiveness of the dissemination activities will occur at the end of the project. Up to now delays in dissemination actions that have been occurred due to project's delays have not caused major drawbacks and it is anticipated that in case of the project's extension approval, all the dissemination activities will have a positive effectiveness in the project.
- Policy impact:
    - The fact that so far, during the initial operational period, the project supports the existing source separation system which is implemented in the hospitality sector and from this implementation about 150tn of food wastes have been diverted from landfill support the Waste Framework Directive (2008/98/EC) and the EU Landfill Directive (1999/31/EC).
    - The main barrier that has been identified for the project's implementation concerns the EU legislation according to which until 2009 the use of food wastes "contaminated" with meat or in general any wastes from the meat industry was restricted to be used as feed. However, from 2009 efforts are being made in order legislation amendments to be carried out. During the projects progress, partners from AUA (Prof. G. Zervas and Assist. Prof. Eleni Tsiplakou) have reviewed and collected all the relative GR and EU legislation and discussions concerning the use of the potential "product" which come out of the F4F project. Thus, the relative to the project legislation and/or discussions are: 2009R_1069, 14211 and European Commission, Brussels, 2/12/2015, COM(2015)0614 final, European Commission, Brussels, ANNEX, 26/1/2017, COM(2017) 33 final, Food and Agriculture Organization 2014. Definitional framework of food loss, Rome, Italy. Retrieved on 17 December from http://www.fao.org/fileadmin/user_upload/save-food/PDF/FLW_Definition_and_Scope_2014.pdf. Food and Agriculture Organization (FAO) 2015. E-conference: utilization of food loss and waste as well as non-food parts as livestock feed, FAO, Rome, Italy. Retrieved on 17 December from http://www.fao.org/save-food/news-andmultimedia/events/detail/fr/c/325893/. Our "potential" produced feed is described (categorized) according to the Article 10 of Regulation 2009R_1069 as

a material which belongs to Category 3. The same Regulation (2009R_1069) in Article 14 allows the use of materials belong to Category 3 for the manufacture of feed intended for farmed animals and will be placed on the market in accordance with Article 31 of that Regulation (2009R_1069). In addition, Regulation 2009R_1069 in Article 31 permits the placing on the market, as feed of farmed animals, of material belonging to Category 3 and, consequently our "potential" feed. The same regulation (2009R_1069), in Article 14 allows the use of Category 3 material for the manufacture of feed for fur animals and companion animals in accordance with Articles 36 and 35 respectively. Finally, Article 13 of Regulation No 14211 permits the use of Category 3 material, so as and our produced "feed" to be used in the diet of zoo animals, fur animals, recognized breeders' dogs or hounds of hounds and dogs and cats in animal shelters. In case that any problem occurs with the use of the F4F produced feed in productive animals and in order to overcome this, the produced feed will be promoted to be used without restrictions by fur animals, which exists in Municipality of Kastoria in the Region of West Macedonia. However, all partners will try their best in order to intervene in the effort which has been start concerning changed to the EU legislation for this issue. A relevant contractor has also been hired by TEIC in order to have contact with EU for this issue. Additionally to the project's procedure and in order to optimize the final product, for extra pasteurization of the produced product, beyond this of solar drying, partners intend to add for the optimum operational period an extra (from what it was foreseen in the proposal) thermal drier. The main purpose of this is to increase the drying temperature up to 90^{o}C.

- Concerning policy developments until now no results have been occurred from the F4F project activities.
- At this reporting period it is yet too early about the project delivered of the results foreseen in the Grant Agreement form B3 "EU ADDED VALUE OF THE PROJECT AND ITS ACTIONS".

6.4. Analysis of benefits

In this section the project's progress will be discussed focusing on the results achieved during this reporting period in the following sub-sections.

1. Environmental benefits
    a. Direct / quantitative environmental benefits:
        i. LIFE Environment & Resource Efficiency: e.g. reductions of emissions, energy or resource savings. During the initial period of operation of the pilot unit 150 metric tonnes of food wastes have been treated in the Solar Drying/ Pasteurisation pilot unit and so diverted from the Heraklion Municipality collection system. Consequently, this quantity, which has already been managed in the pilot unit of the F4F project, has been diverted from the final disposal in the Municipality's landfill. Disposal in the landfill would have resulted the emission of 0.082 tonnes of CH_4 and 0.209 tonnes of CO_2 per tonne of food waste disposed (Handbook of Solid Waste Management, 2nd edition, McGraw-Hill Handbooks, George Tchobanoglous, Frank Kreith, 2002).

One tonne of food waste if disposed to landfill is generating 2.5 tonnes of carbon dioxide equivalent (CO_2eq). Therefore, the diversion of 150 metric tonnes of food waste from landfill resulted in the avoidance 375.8 t of CO_2eq emissions.

The emissions reduction is also due to the fact that the project's production process and waste management as well as the promotion and consumption of the produced product is locally carried out, contributing to the reduction of the required transport. In addition, from the results occurred during the reporting period, the partners assessed the product from the F4F process as a product which can be used in animal testing, both productive and domestic animals, as it comprises of remarkable physicochemical and microbiological quality.

It should be noted that the produced dried feed corresponds to about **25%** (¼) of the input quantity of received food residues.

The environmental benefits of the F4F process will be quantified with the implementation of the Life Cycle Analysis (LCA). However, it should be stated that with the up to now operation of the Solar drying/ Pasteurisation pilot unit, significant savings of physical resources and energy can be achieved by the feed production industry (i.e. energy saving, recycling of food residues etc.) Also, tourist industry seeks and rewards environmental practices applied in the hospitality sector by choosing them, promotes the project processes even more. Finally, it is estimated that, in case of a full-scale unit, the requirement for collection and management of a difficult waste stream will be reduced as it will be derived from the holistic collection system.

b. Qualitative environmental benefits

   i. LIFE Environment & Resource Efficiency: As it has been mentioned above, the product's qualitative physicochemical and microbiological characteristics from the up to now project's production process has been well assessed. Additionally to that, from the synthesis' analysis carried out this period, arise that the collected food wastes could be characterized as a high purity material. This proves that a high-quality product is produced and the production process uses a long term sustainable technology, this of solar energy.

2. Economic benefits: It contributes to waste management and collection cost reduction by reducing the final wastes quantity which has to be disposed of. At the same time, it strengthens the livestock sector with an additional produced feed. This has as a result the energy and consuming resources saving in the feed industry. In the case that after the project completion a well assessed final product arise and the necessary changes to the legislative framework will be achieved, so as the final product to be commercially absorbed by the livestock sector and by the local feed industry then a high economic benefit for the local economy will be achieved. On the other hand, if legislation changes cannot be achieved or in case that the final assessment of the produced feed will not be as high as expected for animal feeding (monogastric or pet animals) then as an alternative, efforts will be made to promote this product to fur animals, as there is no restriction by legislation for this animal category. Fur animals exist in the northern Greece.

3. Social benefits: Developing of a source operation scheme, as more employees will be required so as to increase the operation of such a system. This cost is estimated to be covered by the increased added value of the produced product.

4. Replicability, transferability, cooperation: The technologies used in the project are very simple, low-cost and low energy-efficient and also investment-friendly, so as the productive procedure to be described as a very high replicability. Moreover, in case where change in the legislation framework will be achieved, then launching of the procedure could be expected. If not, then the procedure replicability will only depend on the production cost compared with the conventional commercial feed with same characteristics and nutritional value. Resources needed for the operation of the pilot unit is anticipated to be defined after the full operational period. TEIC has already hired an external assistance so as to contribute to the promotion of a commercial full scale unit (in any case, the requirement for separate sorting and diversion from disposal and recovery of organic wastes according to EU legislation exists) as a material with high quality, high purity and well assessed physico-chemical and nutritional parameters arises.
5. Best Practice lessons: The best practice measures that are estimated to be used during the project are mainly the strengthening of a separative source collection system, in combination with the promotion of refrigerators matched to the needs and requirements of the project to the cooperating hotels.
6. Innovation and demonstration value: Any deviation in the project objectives has been arisen so far.
7. Policy implications: One of the main and important objectives of the project that have to be achieved during the project implementation is the intervention and the change to the relevant existing legislation. The achieving of making mandatory in single-digit the use of the produced feed from food wastes (with a safe and environmentally friendly way) in the rearing of monogastric and also pet animals, according to the widely used model in the synthesis and marketing of diesel in Europe, is an essential project objective.

7. Key Project-level Indicators

Key Project-level Indicators (KPI) are a measurable value that demonstrates how effectively the F4F project is achieving key objectives. KPIs set for the F4F project are referred to a full scale realisation of the F4F process, after the end of the project. It is a properly developed and implemented KPI programme, which incorporates regular review processes during which the PMB assess the meaning of the results and develop corrective actions, if necessary. However, the project is almost a year behind schedule, due to licensing and consequent start-up delays. At this stage, due to lack of reliable information, is challenging to assess any positive or negative deviations from the initially set KPIs' targets. However, the project's web-site and social media have been developed and updated during the project's progress.

However, the F4F process has made some progress towards the KPIs. One hundred and fifty (150) metric tonnes of hotels' food waste have been diverted from landfill, resulting in the avoidance of **376 metric tonnes of CO_{2eq}**. Thirty-seven (37) metric tonnes of dried animal feed were produced as a result of the initial operation of the Solar drying/ Pasteurisation pilot unit.

Nevertheless, as the Solar drying/ Pasteurisation Pilot Unit has successfully been constructed and already operated on a trial basis, and no further delays are anticipated for the forthcoming operational periods of the project, deviations from the targets set initially for KPIs are not anticipated.

8. Comments on the financial report

8.1. Summary of Costs Incurred

The financial part of this report covers all documented expenses incurred during the period from 01/09/2016 (Start Date) until 31/01/2019 (28 Months). During these months of the project's progress, all preparatory actions have been taken place by all partners, in order to proceed with the core of the project, the construction and the operation of the pilot unit.

Table 16. Project's costs incurred

PROJECT COSTS INCURRED			
Cost category	Budget according to the minor changes requested in €*	Costs incurred within the reporting period in €	%**
1. Personnel	1.401.925	777.478,52	55,46%
2. Travel and subsistence	72.840	23.981,36	32,90%
3. External assistance	465.889	134.750,58	28,92%
4. Durables goods: total non-depreciated cost			
- *Infrastructure sub-tot.*	8.400	2.250	26,78%
- *Equipment sub-tot.*	38.967,93	9.133,02	23,44%
- *Prototype sub-tot.*			
5. Consumables	242.800	92.575,74	38,13%
6. Other costs	27.000	6.037,63	22,36%
7. Overheads	158.045	73.282,00	46,36%
TOTAL	**2.415.867**	**1.119.488,85**[3]	**46,34%**

*) If the EASME has officially approved a budget modification through an amendment, indicate the breakdown of the revised budget. Otherwise this should be the budget in the original grant agreement.
**) Calculate the percentages by budget lines: e.g. the % of the budgeted personnel costs that were actually incurred

[3] **Notes about the submitted CONSOLIDATED STATEMENT**
About AUA: The costs claimed include pending payments that derive from contracts that were necessary for the implementation of the tasks of AUA. The pending payments are:

Georgiadou	5,000€
Tsiplakou	8,364.5€
Koukouli	3,473.84€
Total	16,838.34€

Thus, there is a difference of 21,125.61 euros between the Income for AUA and the total of Expenses. That includes the abovementioned pending payment, AUA's own contribution and the corresponding overhead percent that is calculated in the financial statement.
About FUB: On the sheet "funding", it is given the figure for the pre-financing received in 2016 (and not any other "expected" payments.) So, on the sheet "individual cost statement" there is nearly a balance, since we are in the middle of the project.
Since the non-additional salary costs are our own contribution, FUB did not used completely the money of the pre-financing at that time (end of January). This has changed since then with the payment for salary costs in February and March and at the moment our balance is negative. Nevertheless, of course the staff employed from project funding is paid further on according to their working contracts.

According to the previous Table, the project costs incurred during the reference period per cost category, the following have been done:

Personnel: The intensity of the work during the reporting period by all partners was very high, as they had to deal with problems that arose during the project's implementation (as have been described in detail in the submitted amendment request). The fact that partners finally succeeded in overcoming all the difficulties occurred and after the conclusion of the pilot unit construction where the main and most time-consuming actions have been concluded, for this reason up to now about 55% of the personnel cost category has been consumed. As the first and the most difficult period of the project has been concluded, where partners have gained experience and are properly prepared to optimum operate the pilot unit, it is estimated that will be able to run on time and within budget the full scale operation and the optimum operational period of the project (foreseen to last 6 months for each of the 2 remaining periods, from May till October each period), in case of the project's approval of the extension amendment request.

Travel: From the rest operational period of the project up to the end of it a higher budget absorption rate is now expected, as partners will be able to participate in more dissemination actions from the results of the first operational period of the project. Moreover, as the project's progress has been routed many dissemination actions concerning results from the three operational periods are now expected up to the projects end which means more travel costs.

External assistance: Although most of the project's tenders have been conducted and relevant contracts have been signed, however, the repayment of these contracts reaches up to now the 30% and it is expected that until the end of the project these payments to be concluded at 100%.

Infrastructure: The construction of the pilot unit has been concluded and the relevant invoice has been paid. However, the eligible depreciation cost up to now is only 26% and it is expected to be concluded until the projects end date.

Equipment: Same as Infrastructure cost category.

Consumables: The percentage of 38% has been covered during the reference period due to the conduction of experiments that carried out the first operational period and due to the completion of the pilot unit construction. Up to the project's completion it is estimated that 100% of this category will be completed.

Other costs: Same as travel budget category. The other actions of this budget category, such as conferences, LCA and auditing, will be completed up to the project's end date.

In order partners to be able to meet the needs of the minor technical changes due to optimization of the pilot unit operation, made some minor budget transfers per budget category which does not overcomes the limit of 20% of the overall eligible cost. More details concerning these minor budget shifts are presented in Annex 12. Minor budget shifts.

8.2. Accounting system

In the paragraphs below is being presented the description of the accounting systems employed, the procedure of approving costs, and the type of time recording system used for each partner.

Analytical Accounting System:

- ESDAK: The costs relative to the project LIFE-F4F are recorded in separate book records with different costs accounts for personnel costs, consumables, equipment,

travels, e.t.c, (30-6142004, 30-6277001, 30-6422000, 30-6699000, 30-6142002) and are completely identifiable and controllable.

- HUA: In the Financial Accounting Programme of Harokopio University, the LIFE-F4F project is identified as #363. The project has a separate bank account (National Bank of Greece, IBAN GR6601100530000005300191359)
- TEIC: All the project's expenditures are recorded in separate book records according to the General National Accounting System. An internal software program, namely RESCOM, is used for the management of each project. This number is being used throughout all the financial transactions between the Scientific Responsible in charge of the work and the Research Committee, i.e., all documents, invoices, etc. related to the specific project are being dated and stamped with this reference number together with an additional protocol number. The value of the items concerned is written off in accordance with the tax and accounting rules applicable to the RC. For the project "Food for Feed" is used the internal number 80378 and is connected to the accounting system. All invoices, travels related to the specific project are being dated and stamped with this reference number. The project has also a separate bank account.
- FUB: Agreement Number FUB-Contract number: 2016000303
  Funds 0408124104
  Project accounts and projects codes are kept separately from other accounts.
  The university uses cash bases accounting system.
- AUA: The F4F project is filed in the University's accounting system, under the code 08.0064.

Presentation of the procedure of approving costs:

- ESDAK: There are certain procurement procedures that are being followed systematically which is in accordance with the Greek Legislation (Law 4412/2016). Concerning travel and subsistence costs, there is a clear and transparent method of calculation (Law N.4336/2015 FEK 94/A').
- HUA: Overall, the procedure for cost approval evolves in two steps. Initially, the Project Manager (Prof. K. Lasaridi) checks the expenses and the corresponding justification/ documentation, with regards to the Project's budget. Then, after the positive opinion of the administration stuff in the accounting department, the Vice-Rector of Financial Affairs and Development (Prof. D. Panagiotakos) approves the costs.
  Subcontractors are selected according to University rules in accordance with the Law 4412/2016.
  Concerning travel and subsistence costs, invoices (hotel, fuels/tickets, etc.) and proofs of travel (e.g. boarding pass, Certification of attendance in Conferences, Agenda) are provided to HUA's financial department in order to calculate the travel costs and the allowances. According to law for the public sector (Law 4336/2015).
- TEIC: There are certain procurement procedures that are being followed systematically for the purchase of durable goods which is in accordance with the Greek and European Legislation, and the relevant decisions of Management Committee of TEIC.

- FUB: Records of the expenditures are kept on paper as well as in an electronic system. The excel file for the project expenditures, invoices and other documents related to the project are well-kept by the project leaders and the administration of the Freie Universität Berlin. All expenditures are listed on the LIFE financial reporting Excel file.
- AUA: Overall, the procedure for cost approval evolves in two steps. Initially, the Project Manager of AUA (G. Zervas) checks the expenses and the corresponding justification/documentation, with regards to the Project's budget.n the second step, Prof. Zervas submits a claim for the foreseen costs. After the approval of the Special Account for Research Funds, the team can proceed with spending the requested amount for the project.

Time registration system:

- ESDAK, HUA, TEIC, AUA: The LIFE template is used to devote the working hours to the project and is manually completed. All employees are being registering time through timesheets. The timesheets are checked and signed monthly by the line manager and the person working for the project.
- FUB: Electronic time sheets are used. Timesheets are filled in by the personnel and signed at the end of each month by the project leaders. All documents are well-kept by the project leaders and the administration of the Freie Universität Berlin.

Projects' invoices:

Stamp is used on invoices when the supplier cannot enter the project's reference number on the invoices.

FUB: The project reference number is "LIFE15ENV/GR/000257/Food for Feed. When placing an order the internal funds number for the LIFE project has to be stated on the written order and is also marked on the invoice. All expenditures are recorded by the University using SAP based accounting system. In addition, the official Excel file for Life projects will be used by the project leaders to record the project expenditures.

8.3. Partnership arrangements

For the moment, only pre-financing payments are made from the coordinating beneficiary to the associated beneficiaries.

Each beneficiary is completed financial reports on the basis of the costs occurred according to the level of implementation of the project, checked by the project manager. The coordinating beneficiary are collected all the financial and technical reports with the relevant documents, and checked if the costs declared are according to the project. Then the consolidated cost statement is prepared.

8.4. Certificate on the financial statement

The auditor's report will be included with the final financial report and will follow the format of the standard audit report form available on the LIFE website.

8.5. Estimation of person-days used per action

Table 17. Estimation of person – days used per action

Action type	Budgeted person-days	Estimated % of person-days spent
All projects when applicable Action A: Preparatory actions		
NAT and CLIMA projects Action B: Purchase/lease of land and/or compensation payment for payment rights		
ENV projects Action B: Implementation actions	2081,05	30%
GIE projects Action B: Core actions		
NAT projects Action C – Concrete conservation actions		
CLIMA projects Action C: Implementation actions		
ENV and GIE projects Action C: Monitoring of the impact of the project action	208,105	3%
NAT and CLIMA projects Action D: Monitoring and impact assessment		
ENV and GIE projects Action D: Public awareness/79ommunication and dissemination of results	382,419	12%
NAT and CLIMA projects Action E: Communication and Dissemination of results		
ENV and GIE projects Action E: Project management	721,43	10,4%
NAT and CLIMA projects Action F: Project management (and progress)		
TOTAL		

Details about the person days spend during the reference period by all partners are being described in paragraph **3. Executive summary** of the present report.

9. Envisaged progress until next report

- During the reference period of this mid term report for the LIFE-F4F project the initiating operational period of the pilot unit has been concluded with a twelve month delay. However, all tenders for the projects' progress have been concluded, the construction of the pilot unit has also been concluded and no more delays are being expected by partners as the projects' progress has been routed. During this period partners have implemented many trials with the collected food wastes, they have located the technical and operational problems occurred during these different trials and they have managed to optimize them. The full scale operational period is now expected on spring 2019 without delays.
- All projects' actions have been updated due to the delays occurred during the projects' progress. The approved and the updated Gantt chart are presented below and have also been submitted by partners with the amendment request for approving the projects' time extension on January, 2019.

Approved Gantt Chart

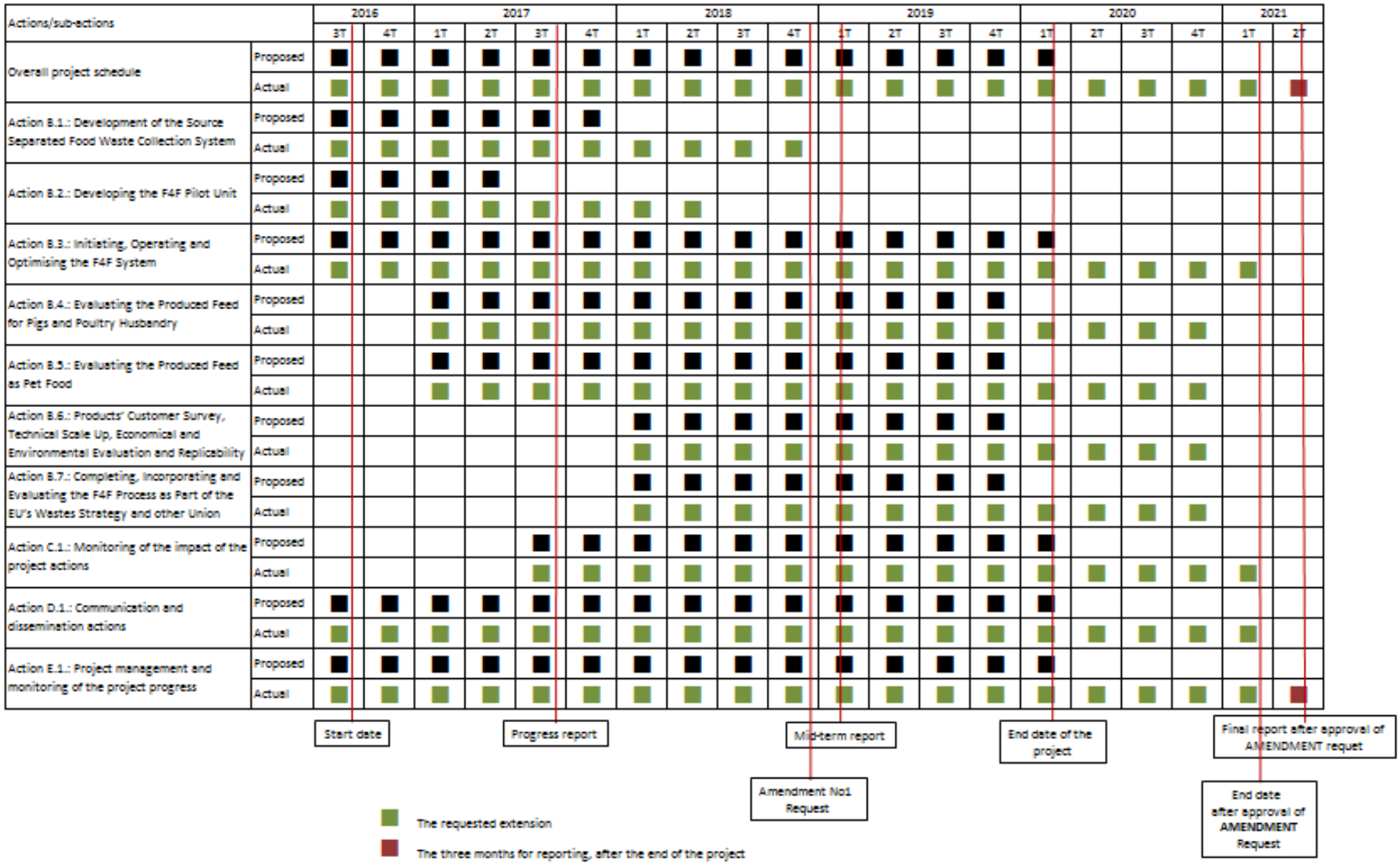
Actions/sub-actions		2016		2017				2018				2019				2020	
		3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T	3T	4T	1T	2T
Overall project schedule	Proposed	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Action B.1.: Development of the Source Separated Food Waste Collection System	Proposed	■	■	■	■	■	■										
Action B.2.: Developing the F4F Pilot Unit	Proposed	■	■	■	■												
Action B.3.: Initiating, Operating and Optimising the F4F System	Proposed	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Action B.4.: Evaluating the Produced Feed for Pigs and Poultry Husbandry	Proposed			■	■	■	■	■	■	■	■	■	■	■	■		
Action B.5.: Evaluating the Produced Feed as Pet Food	Proposed			■	■	■	■	■	■	■	■	■	■	■	■		
Action B.6.: Products' Customer Survey, Technical Scale Up, Economical and Environmental Evaluation and Replicability	Proposed							■	■	■	■	■	■	■	■		
Action B.7.: Completing, Incorporating and Evaluating the F4F Process as Part of the EU's Wastes Strategy and other Union	Proposed							■	■	■	■	■	■	■	■		
Action C.1.: Monitoring of the impact of the project actions	Proposed					■	■	■	■	■	■	■	■	■	■	■	
Action D.1.: Communication and dissemination actions	Proposed	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Action E.1.: Project management and monitoring of the project progress	Proposed	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

Start date

End date

Final report

Updated Gantt Chart



10. Annexes

Annex 1. :	**Administrative part**
	Annex_1_Sub-Annex.1.1. Management Structure per partner.
Annex 2. :	**Deliverables for Action B.1.**
	Annex_2_Sub-Annex.2.1. Selected hotels source separation system qualitatively and quantitatively survey Annex_2_Sub-Annex.2.2. Short listed and selected hotels optimum collection routes Annex_2_Sub-Annex 2.3. Drying and microbiological tests by TEIC Annex_2_Sub-Annex 2.4. Tender for consumables by TEIC Annex_2_Sub-Annex.2.5. Food wastes collection cost estimation system
Annex 3. :	**Deliverables for Action B.2.**
	Annex_3_Sub-Annex 3.1. Licenses Annex_3_Sub-Annex 3.2. Tender for pilot unit Construction Annex_3_Sub-Annex 3.3. Pilot Unit and turners Construction Annex_3_Sub-Annex 3.4. Tenders for turners' construction
Annex 4. :	**Deliverables for Action B.3.**
	Annex_4_Sub-Annex 4.1. Tendering procedure for waste collection system Annex_4_Sub-Annex 4.2. Initial operational period
Annex 5. :	**Deliverables for Action B.4.**
	Annex_5_Sub-Annex 5.1. Analysis of produced feed_AUA
Annex 6. :	**Deliverables for Action B.5.**
	Annex_6_Sub-Annex 6.1. Analysis of the produced feed_FUB
Annex 7. :	**Deliverables for Action B.6.**
	No deliverables in this action for the reporting period
Annex 8. :	**Deliverables for Action B.7.**
	Annex_8_Sub-Annex 8.1. Alternative use of the produced feed
Annex 9. :	**Deliverables for Action C.1.**
	No deliverables in this action for the reporting period
Annex 10. :	**Deliverables for Action D.1.**
	Annex_10_Sub-Annex_10.1. Dissemination activities towards the general public Annex_10_Sub-Annex_10.2. External assistance by TEIC
Annex 11. :	**Deliverables for Action E.1.**
	Annex_11.1. Partners meetings.
Annex 12. :	**Minor budget shifts**
	Minor budget shifts