



LIFE Project Number
LIFE15 ENV/GR/000257

LIFE PROJECT NAME or Acronym
LIFE-F4F (Food for Feed)



Data

Action:	B3 Initiating, Operating and Optimising the F4F System
Partner:	ALL PARTNERS
Deliverable:	B3.2 Data, results and feed produced, during the first full scale operational period

Table of contents

1.	1ST FULL SCALE OPERATIONAL PERIOD OF THE F4F PROJECT	3
1.1.	OPTIMIZATIONS IN THE PILOT UNIT BEFORE THE STARTUP OF THE FIRST FULL SCALE OPERATIONAL PERIOD.	3
1.2.	DATA, RESULTS AND FEED PRODUCED DURING THE FIRST FULL SCALE OPERATIONAL PERIOD.	7
1.3.	PHOTOS FROM THE REFERENCE PERIOD.....	17

1. 1st full scale operational period of the F4F project

This is the second operational period for the F4F project, which is mainly the 1st full scale operational period, following the initial operation period, after the implementation of some optimizations that carried out between these two periods.

The main objective of this period is the operation of the F4F system under real conditions, aiming to test all components of the process, as realistic as possible. However, during this period, partners tried to determine the operational parameters including performance and operational costs, as well as to identify possible shortcomings, problems, limitations and required technical additions or improvements so as more optimization actions to implement for the last, 2nd optimum operational period.

Specific “corrective” activities during collection and operation of the pilot unit took place (hand sorting, pulverizing, as well as solar drying / pasteurizing), in order to deliver the quality needed for each group of animals targeted (pets and productive animals, as pigs and poultry), as proposed by partners and all these extra corrective actions is estimated to be concluded in the unit up to the end of May, 2020.

The collection system and the operation of the pilot unit during this period was carried out by ESDAK’s relevant contractor with the support of HMU. The operation during this period follows the data and results of the initial operational period but also data of the feed evaluation actions (B4 and B5).

This operational period of the project was concluded as foreseen, after the approval of the submitted amendment No1 extension request.

In the following paragraphs of the present report data and results that occurred during the first full scale operational period are presented.

1.1. Optimizations in the pilot unit before the startup of the first full scale operational period.

Preparatory actions by partners for the startup of the new full-scale operational period of the pilot unit. Partners during this period moved on to actions for the optimization in the construction and operation of the pilot unit. More specifically, on April 24th, ESDAK assigned a procurement concerning the optimization of the equipment of the pretreatment unit. This assignment included the following:

1. Additional equipment in the pretreatment unit for better grinding. A pulverizer has been added, following the existing shredder.





Picture 1. The pulverizer connected after the shredder

2. Additional equipment in the floor heating system has been added. More specifically, a heating pump and 4 more solar panels were added.





Picture 2. The heating pump and 4 more new solar panels

3. Additional insects' protection, air curtains were added in the doors of the pretreatment unit.



Picture 3. Two air curtains have been added in the doors of the pretreatment unit

4. Moreover, in the entrance of the solar drying unit a closet covered with protection insect net has also been added.



Picture 4. Entrance in the solar drying unit with insect protection

5. Mechanisms for automatic door closing has been added



Picture 5. Automatic mechanisms in the doors

6. Hydraulic lifting system for bins.



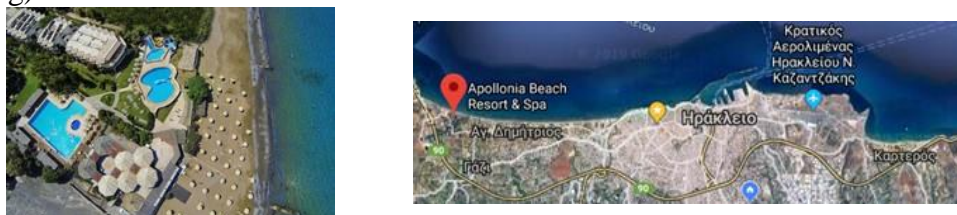
Picture 6. Hydraulic lifting system

7. A pressure washer machine with hot water for cleaning the equipment and the interior of the pre-treatment unit.

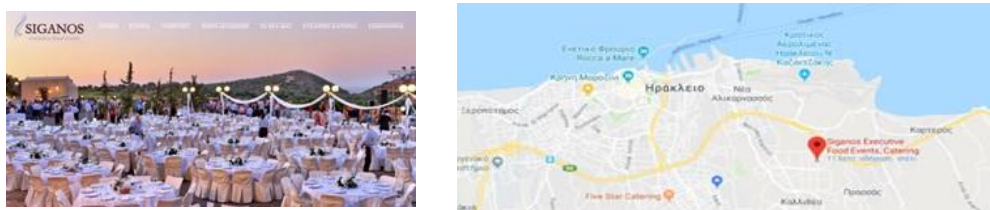


Picture 7. Pressure washer machine

A new hotel and a catering service have been added for this period in the F4F project. These are APOLLONIA BEACH RESORT & SPA and Siganos executive food events (Catering).



Picture 8. Apollonia beach resort & spa



Picture 9. Siganos executive food events (catering)

1.2. Data, results and feed produced during the first full scale operational period.

The official first full scale operational period started on 3rd of June, 2019 and concluded on 31st of October, 2019. Within 123 days, about 145tn of food waste have been collected from hotels and managed into the F4F pilot unit. From this input quantity of food waste, after hand sorting, the shredded food waste that was transferred into the solar drying unit was about 85tn, producing finally about 30tn of feed. The initial moisture of the food waste was about 75% (average) and the moisture of the final product was about 10-12%.

During this period, many different batches occurred in the pilot unit. More specifically, the following batches were managed in the unit, according weighing the input food waste in the unit and the quantity feeding the drying tanks in the solar drying unit.

1. The period from 03/06/2019 up to 08/06/2019 tests carried out in the pilot unit with the input food waste so as to check the operation of the relevant equipment. All the treated waste was forwarded to the horizontal drying tank. The input food waste quantity for this period was 6tn and the treated food waste into the solar drying unit was less than 1tn.
2. The period from 10/06/2019 up to 19/06/2019 the drying carried out in the vertical tank of the solar drying unit. The input food waste quantity for this period was 14tn and the treated food waste into the solar drying unit was about 4tn, before drying.
3. The period from 20/06/2019 up to 09/07/2019 the drying carried out in the horizontal tank of the solar drying unit. This is the 1st batch produced in the pilot unit. The input food waste quantity for this period was 22tn and the treated food waste into the solar drying unit was about 16tn, before drying.
4. The period from 10/07/2019 up to 03/08/2019 the drying carried out in the vertical tank of the solar drying unit. This is the 2nd batch produced in the pilot unit. The input food waste quantity for this period was 29tn and the treated food waste into the solar drying unit was about 20tn, before drying.
5. The period from 05/08/2019 up to 03/09/2019 the drying carried out in the horizontal tank of the solar drying unit. This is the 3rd batch produced in the pilot unit. The input food waste quantity for this period was 25.5tn and the treated food waste into the solar drying unit was about 18.5tn, before drying.
6. The period from 04/09/2019 up to 10/09/2019 the drying carried out in the vertical tank of the solar drying unit. In this period a test without meat carried out, after partners' from AUA and FUB request to remove the meat from the collected food waste. This was in order to be able to check the differences among these two different material, not only in the physicochemical analyses, but also in the results

to trials in animals. Sample was send to all partners for analyses and only AUA received quantity for trials. The next forthcoming period these test should be repeated so as AUA to repeat the trials and FUB to conduct them in pets. The input food waste quantity for this period was 7tn and the treated food waste into the solar drying unit was about 3tn, before drying.

7. The period from 12/09/2019 up to 25/09/2019 the drying carried out in the horizontal tank of the solar drying unit. This is the 4th batch produced in the pilot unit. The input food waste quantity for this period was 11tn and the treated food waste into the solar drying unit was about 8tn, before drying.
8. The period from 26/09/2019 up to 12/10/2019 the drying carried out in the horizontal tank of the solar drying unit. This is the 5th batch produced in the pilot unit. The input food waste quantity for this period was 14tn and the treated food waste into the solar drying unit was about 10tn, before drying.
9. The period from 12/10/2019 up to 16/10/2019 the drying carried out in the vertical tank of the solar drying unit. In this period a test only with oranges carried out, after partners' trial to investigate the possibility of alternative use of only oranges as animal feed, as it was found this period that the collected oranges quantity is about the 20% of the total collected food waste.
10. The period from 14/10/2019 up to 31/10/2019 the drying carried out in the horizontal tank of the solar drying unit. This is the 6th batch produced in the pilot unit. The input food waste quantity for this period was 10.5tn and the treated food waste into the solar drying unit was about 8.5tn, before drying.

Samples for analyses have been send on November to partners for analyses. More specifically, samples from the 3rd, 4th and 5th batch were sent to AUA, FUB and HUA, so as to decide according analyses which is the most appropriate product to be used for animal trials and also samples were sent from the tests "without meat" and "only oranges". These batches were selected as the were adequate available quantities for trials. Partners from AUA and FUB received the final dried product and also sterilized sample of this. HUA received only the final product without sterilization. In the following Table 1, the samples sent for analyses to each partner are presented.

Table 1. Samples sent to partners for analyses with relevant coding

Sample	3 rd batch	4 th batch	5 th batch	Without meat	Only oranges
Code	1(2)_(3/8)_3	2(2)_(25/9)_4	3(2)_(12/10)_5	4(2)_(10/9)_7_(WM)	5(2)_(16/10)_8_(OR)

Samples coding:

X(Y)_(a/b)_c:	X ... is the number of sampling from the pilot unit startup (1 = 1 st sample, 2 = 2 nd sample, etc.)
X(Y)_(a/b)_c:	(Y) ... is the second operational period
X(Y)_(a/b)_c:	(a/b) ... the date of sampling (a = day, b=month)
X(Y)_(a/b)_c:	c ... the number of batch
X(Y)_(a/b)_c_(ST):	ST ... sterilized
X(Y)_(a/b)_c_(WM):	WM ... without meat
X(Y)_(a/b)_c_(OR):	OR ... only oranges

In the pictures below the collected food wastes from the cooperative hotels into the pretreatment unit are being presented.



Picture 10. During the start-up of the second operational period of the F4F pilot unit. The food wastes after shredding and pulverising



Picture 11. Density of the pulverized food wastes (5,52 kg / 5lt)





Picture 12. During the start up and operation of the second operational period of the F4F pilot unit (solar drying unit).

Moreover, during the spring of 2019 partners have started trials in order to investigate the protein solubility in a sterilized final product. These trials are carried out so as partners to follow legally authorized practices concerning policy issues about the possibility of the legal final use of the produced F4F product. The final product has been sterilized in HMU and then send to partners to investigate how the sterilization affects the protein solubility.



Picture 13. The final product before and after sterilization

Table 2. Results from the products sterilization vs the protein solubility

Action B3: Initiating, Operating and Optimising the F4F System
 Deliverable B3.2: Data, results and feed produced, during the first full scale operational period

SAMPLE CODE	*CRUDE PROTEIN %	INSOLUBLE PROTEIN %	**SOLUBLE PROTEIN %	***NON PROTEIN NITROGEN %	****TRUE PROTEIN %
FINAL PRODUCT	22.15	10.83	11.32	10.04	1.28
STERILIZED PRODUCT 1 (in a jar – 15cm depth)	20.99	11.29	9.7	8.43	1.27
STERILIZED PRODUCT 2 (in baking pan – 2cm depth)	21.61	12.02	9.59	8.64	0.95

The collected and treated quantities of food wastes in the pilot unit from the cooperative hotels during this operational period are presented in the following diagrams, per month and per hotel.

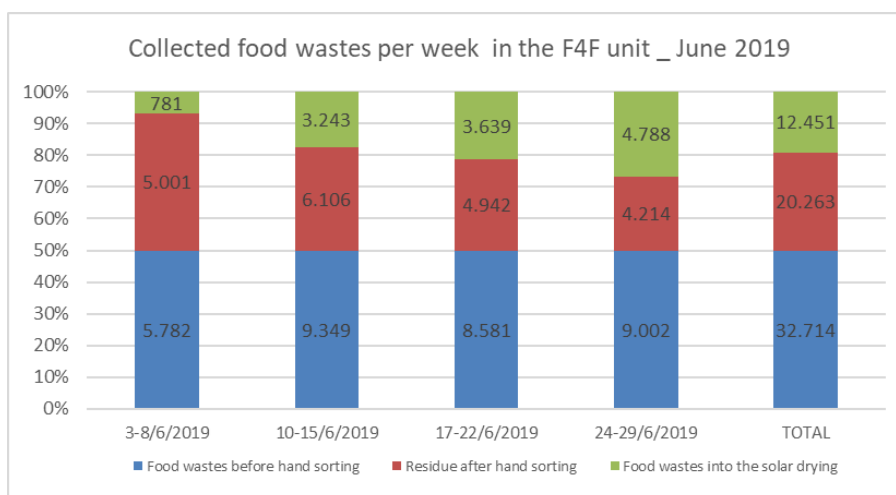


Diagram 1. The total and per week collected food waste during June 2019

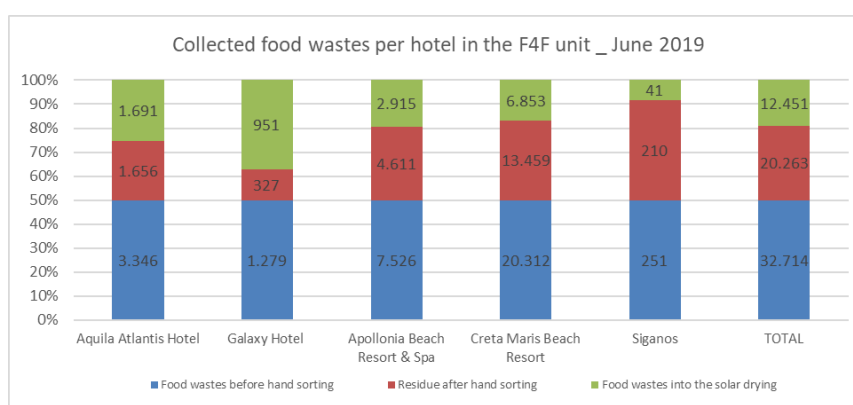


Diagram 2. The total and per hotel collected food waste during June 2019

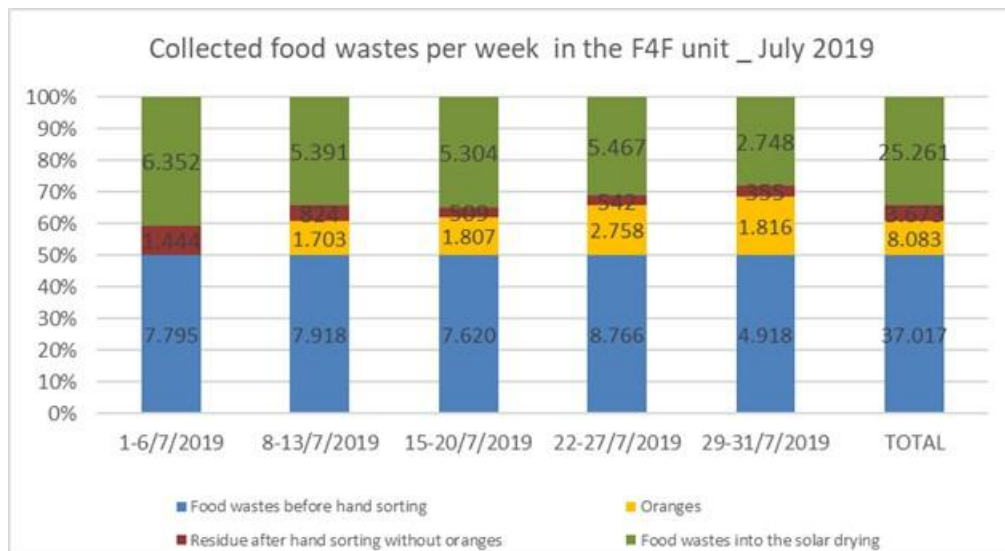


Diagram 3. The total and per week collected food wastes during July 2019

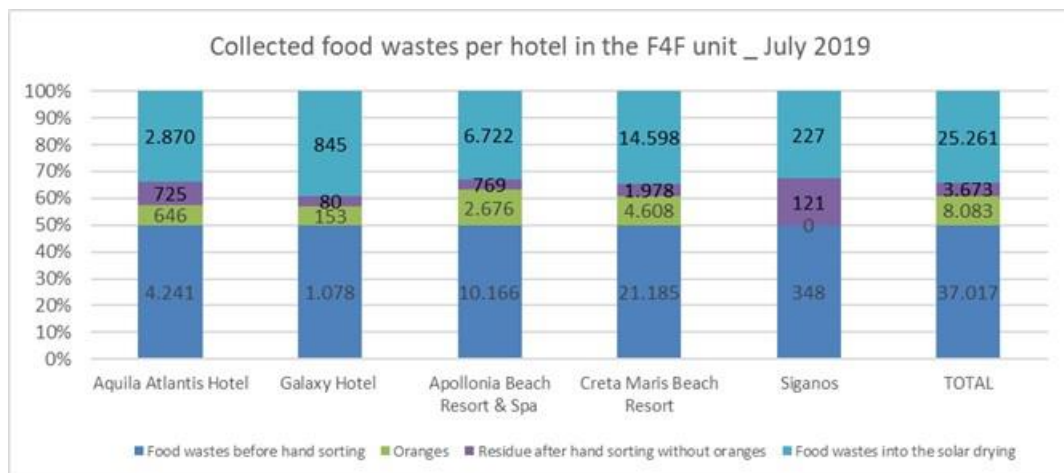


Diagram 4. The total and per hotel collected food wastes during July 2019

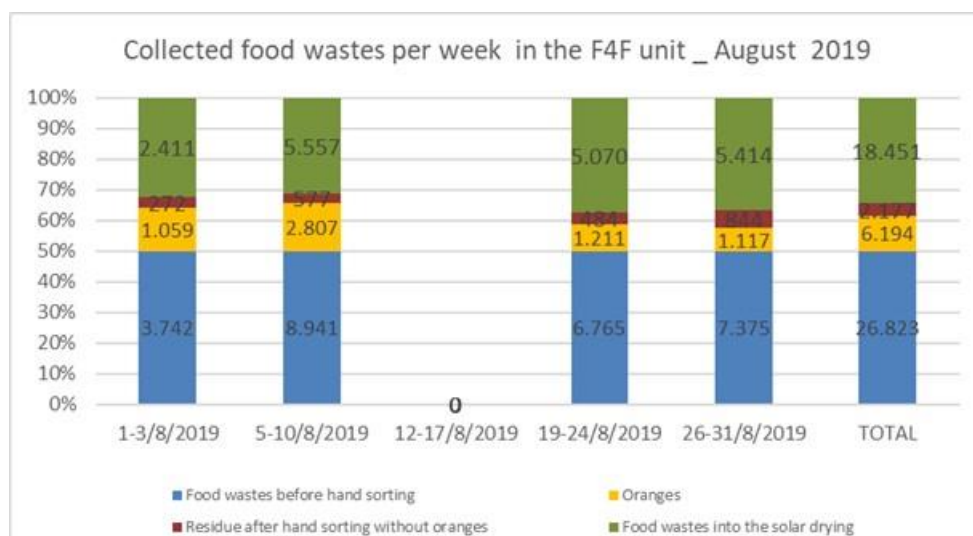


Diagram 5. The total and per week collected food wastes during August 2019



Diagram 6. The total and per hotel collected food wastes during August 2019

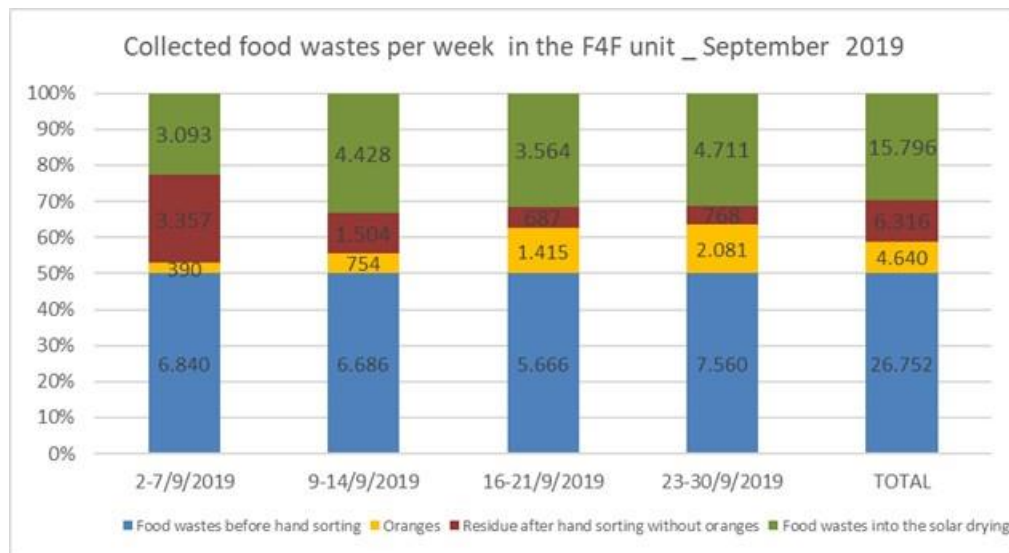


Diagram 7. The total and per week collected food wastes during September 2019



Diagram 8. The total and per hotel collected food wastes during September 2019

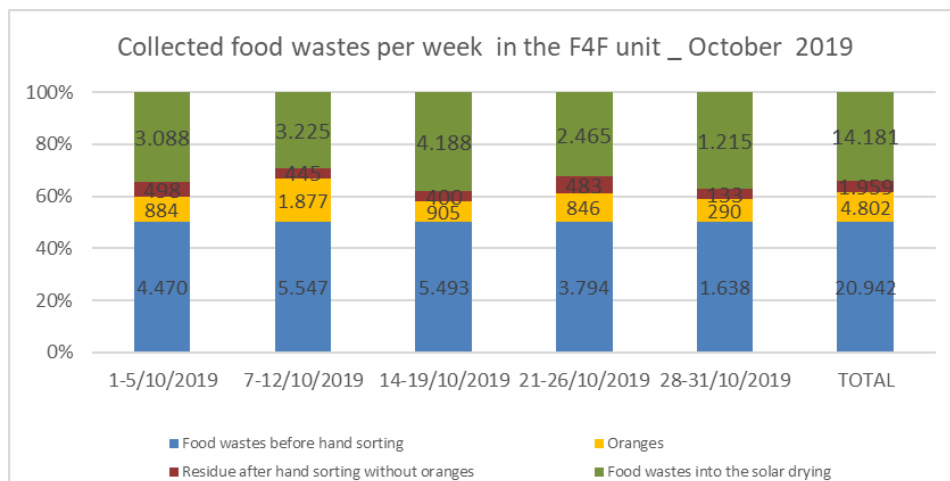


Diagram 9. The total and per week collected food wastes during October 2019

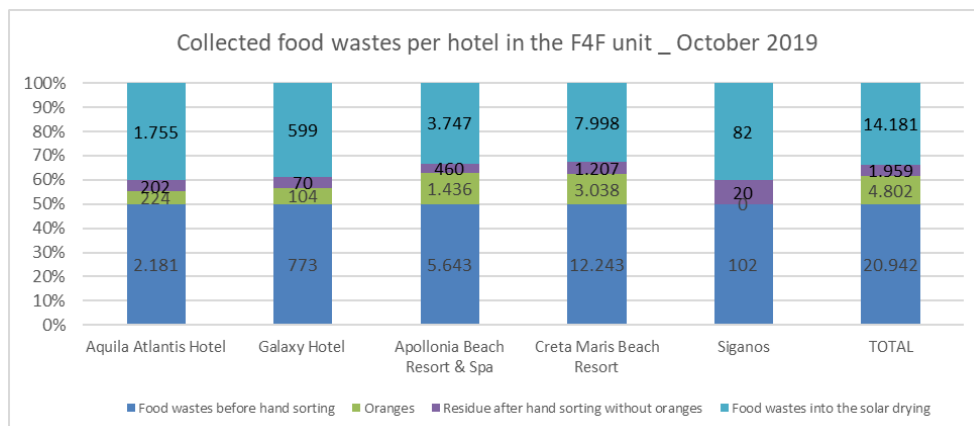


Diagram 10. The total and per hotel collected food wastes during October 2019

In total, during this first full scale operational period of the F4 pilot unit, the following food waste quantities have been collected and treated into the F4F pilot unit.

Table 3. Total collected food waste during the first full scale operational period.

Month	Total collected food waste (Kg)	Total food waste in the solar drying unit (Kg)
June	32.714	12.451
July	37.017	25.261
August	26.823	18.451
September	26.752	15.796
October	20.942	14.181
Total quantities	144.248	86.140

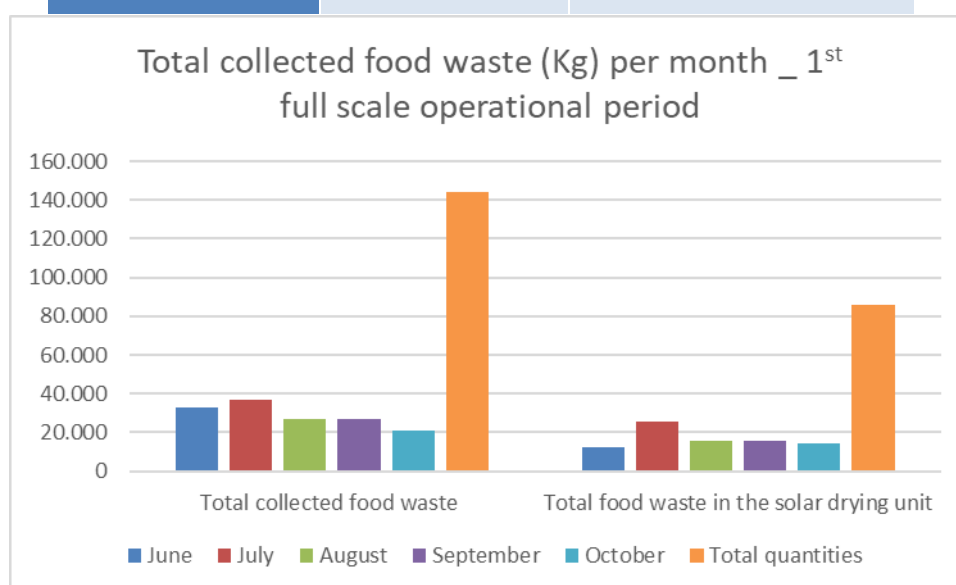


Diagram 11. Total collected food waste during the first full scale operational period

Table 4. Total collected food waste per hotel, during the first full scale operational period.

Total quantities per hotel	Aquila Atlantis Hotel	Galaxy Hotel	Apollonia Beach Resort & Spa	Creta Maris Beach Resort	Siganos Catering service	TOTAL
Food wastes before hand sorting	14.518	4.343	37.994	86.353	1.040	144.248
Food wastes into the solar drying	9.226	3.194	22.353	50.735	633	86.140

Oranges	2.299	638	10.588	17.695	0	31.219
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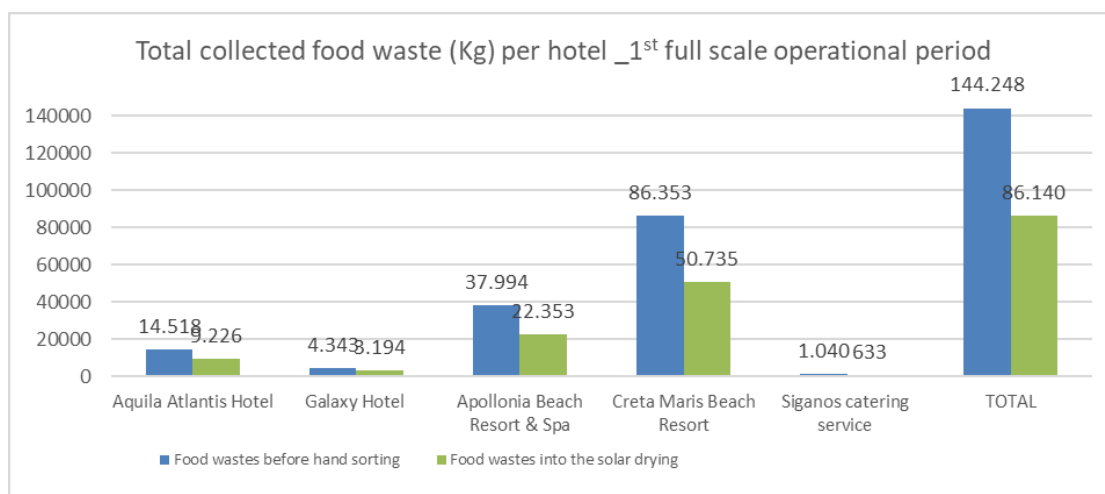


Diagram 12. Total collected food waste (Kg) per hotel during the first full scale operational period

An average of the drying rate during the reference period is presented on the following tables, concerning the two types of turners, the horizontal and the vertical one.

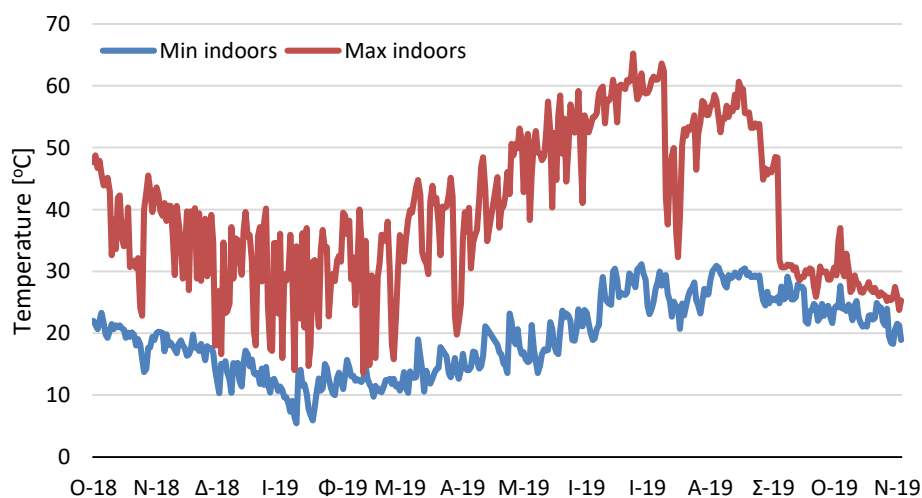
Table 5. Average drying rate in the solar drying pilot unit during June – October, 2019 – Horizontal turner

Drying (days)	1 st day	5 th day	7 th day	8 th day
Moisture (%)	75%	32%	12%	10%

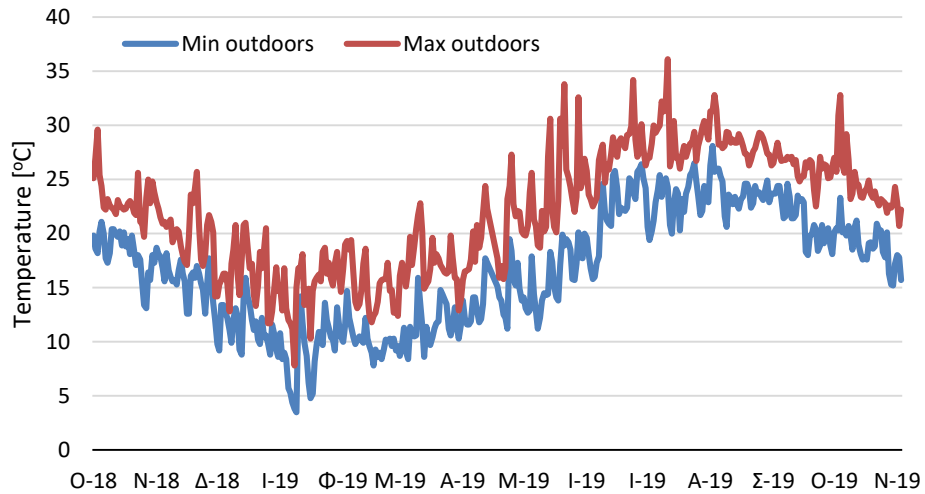
Table 6. Average drying rate in the solar drying pilot unit during June – October, 2019 – Vertical turner

Drying (days)	1 st day	5 th day	10 th day	12 th day
Moisture (%)	80%	60%	15%	10%

The relevant temperature profile for the reference period, indoors and outdoors of the F4F unit is presenting in the following graphs.



Graph 1. F4F Pilot unit indoor min and max temperature



Graph 2. F4F Pilot unit outdoor min and max temperature

1.3. Photos from the reference period.



Picture 14. During food waste collection from hotels





Picture 15. During hand sorting



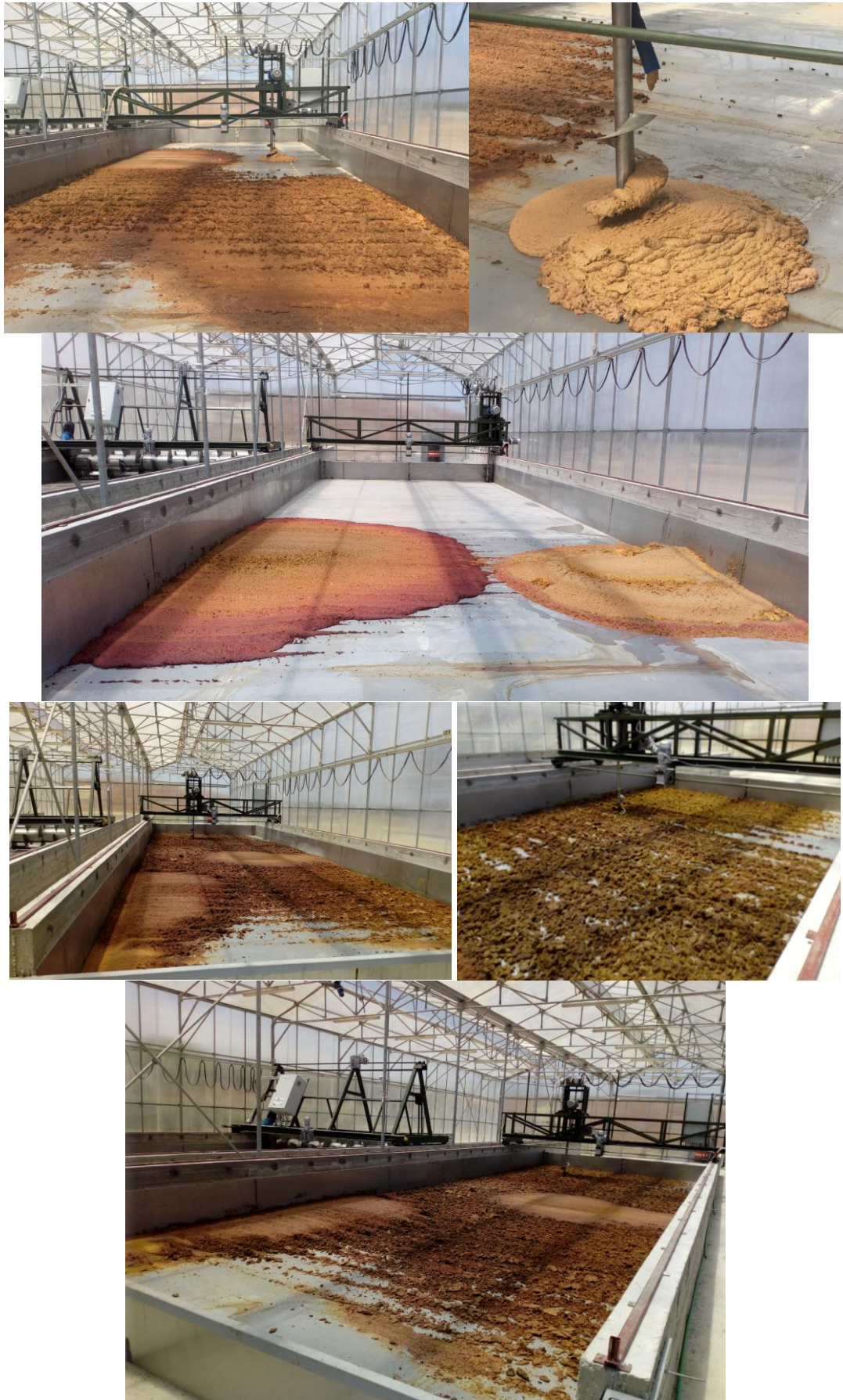
Picture 16. Food waste shredding, after hand sorting



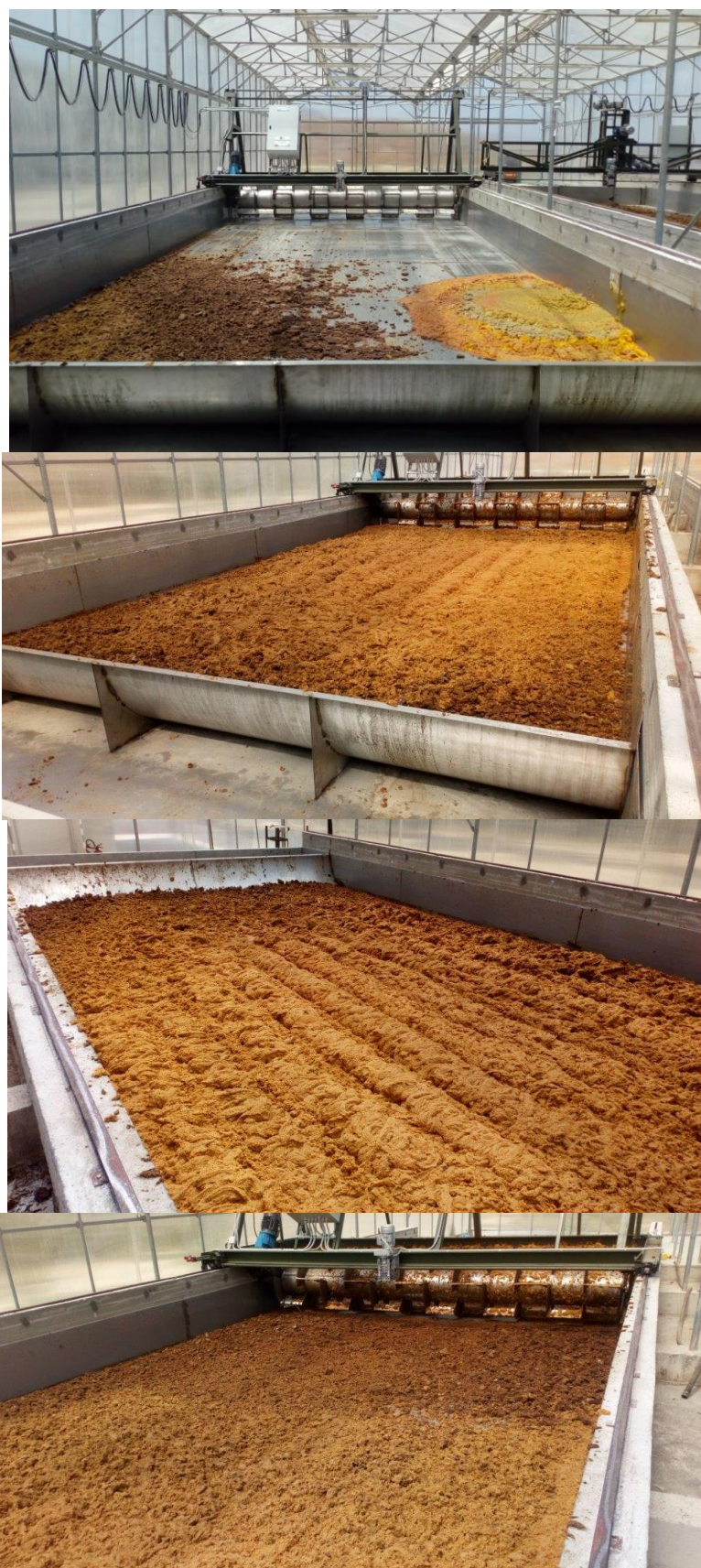
Picture 17. The shredder and the pulverizer



Picture 18. Pulverizing the food waste after shredding



Picture 19. During drying in the solar drying tank with the vertical turner



Picture 20. During drying in the solar drying tank with the horizontal turner