LIFE Project Number

LIFE15 ENV/GR/000257

LIFE PROJECT NAME or Acronym

LIFE-F4F (Food for Feed)

Data	
Action:	B2 Developing the F4F Pilot Unit
Partner:	ESDAK
Deliverable:	B2.3 The full operational solar drying pilot unit

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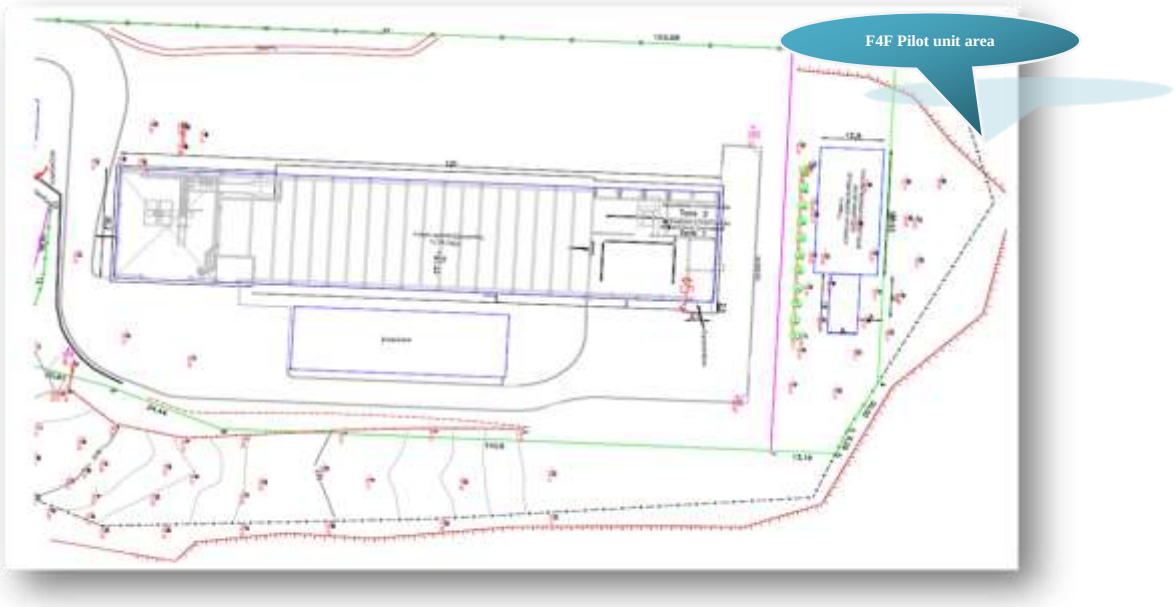
1. The construction of the pilot unit

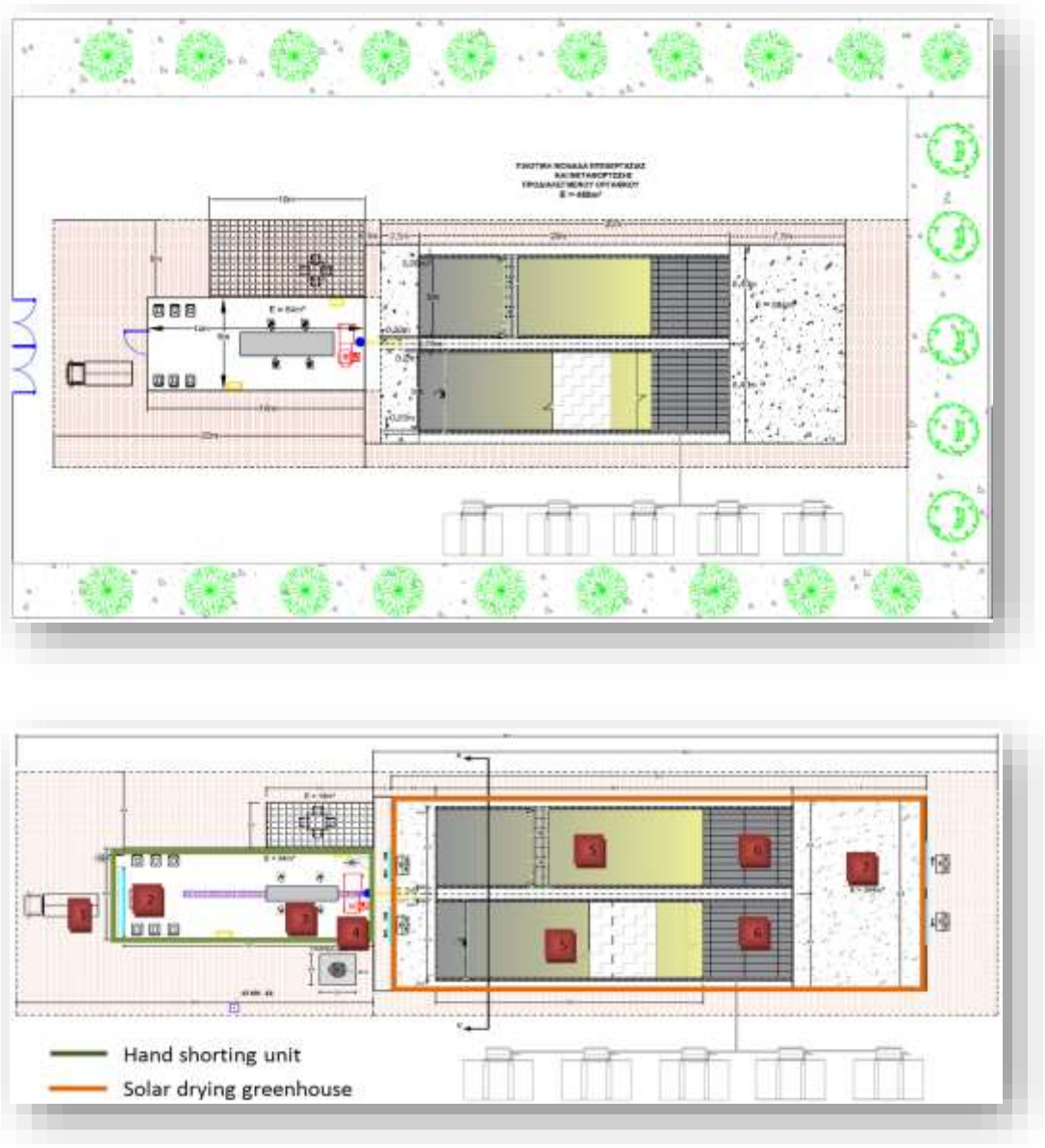
The construction of the pilot unit started on February, 2018, after the signed of the contractor relevant contract and finally concluded on 31st of May, 2018. Before the start up of the pilot unit construction, territory marking and works for grading the ground took place.



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

Picture 2. Territory marking for the F4F pilot unit placement

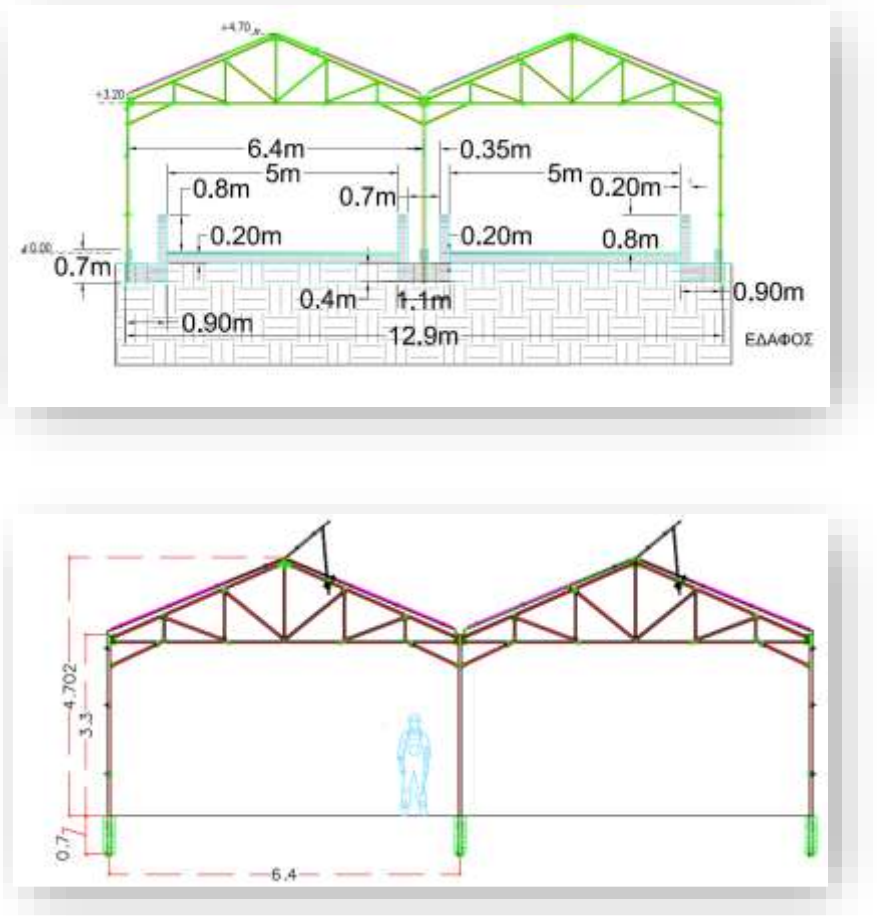
Picture 3. Works for grading the ground



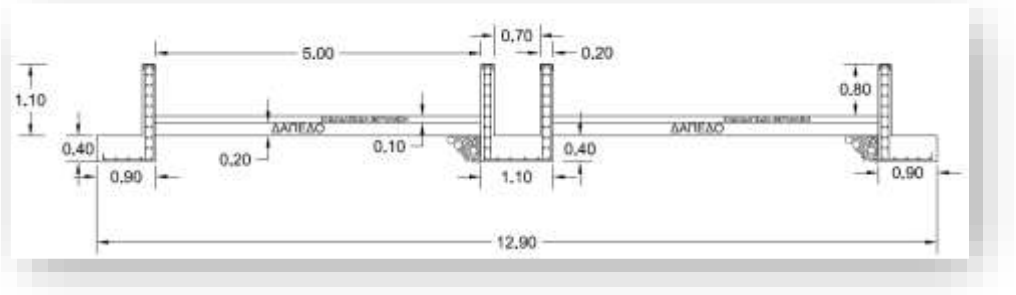
Picture 4. PLAN VIEW of the Pilot Unit.

The total area of the pilot unit is 468m^2. As it is being presented in the plan view, the pilot unit consists from the **prefabricated or hand sorting building** (green line) where hand shorting of the incoming food wastes takes place. This building is a 14m long and 6m wide room (total area 84m^2) where air condition and air extraction units for health and safety issues have been installed. Moreover, these units have also been used for the preservation of the incoming food wastes. Into this building the relevant personnel from the food wastes collection system (1) deposit the bins from the refrigerator track at the first few meters (2) of the building. Moreover, in this prefabricated building has been installed a 6m conveyer belt (3) where four people work in order to hand short and remove all foreign particles from the hotels' collected food wastes (metals, plastic, glass, etc.). Following the conveyor belt a shredder (4) has been installed so as the food wastes to be shredded in pulp. This pulp is being collected in a small inox tank under the shredder where a pump forwards the pulp through a pipe suitable for food into the drying halls of the solar drying greenhouse (red line). According to the plan view presented above, the solar drying greenhouse is 30m long and 12.8m wide (total area 384m^2). The cross section of the solar drying greenhouse and the floor are being presented in the following pictures. Into the solar drying greenhouse, two drying halls have been constructed. The length of the halls is 20m

and the width of them is 5m (total area per each hall is 100m^2). From this area, 15mx5m have been used for the drying (5), where extensive network of pipelines connected with water solar heaters has been installed. In each drying hall and on the top of the pipelines a high quality stainless still cover has been placed in order to amplify the temperature of the food waste pulp and to accelerate the drying time. Each corridor/drying hall has 0.8m high reinforced concrete side walls, on the top of which the drying turning systems have been placed. At the end of these drying halls (6) there is an area for emptying the final product after drying and for packing (this is for the final optimum operational period of the project). The rest area (7) into the solar drying greenhouse has been used for temporary storage of the produced products.



Picture 5. Cross section of the solar drying greenhouse hall



Picture 6. Cross section of the concrete floor of the solar drying greenhouse halls

In the following pictures steps during the pilot unit construction are being presented.

Picture 7. During concrete formwork

Picture 8. Construction of the greenhouse framework

Picture 9. After covering the greenhouse with polycarbonate sheets

Picture 10. During the prefabricated unit construction with the relevant equipment

In the following pictures works concerning the construction of the drying halls into the solar drying greenhouse are being presented.

Picture 11. During the installation of the network of pipelines connected with water solar heater system

Picture 12. After covering with concrete the network of pipelines connected with water solar heater system

For the operation of the heating floor system the following equipment have been installed in the pilot unit, as being presented in the pictures below.

Picture 13. The heating system with the supply and return collectors, the boiler, the solar panels and the temperature display panel of the network of pipelines for the floor heating system

Above of the heating floor system, inox sheets have been placed in the solar drying halls, as being presented in the following pictures.

Picture 14. During installation of the inox sheets above the floor heating system in each drying hall

Picture 15. Funs into the solar drying greenhouse for air circulation

A panoramic view of the constructed pilot unit is being presented in the following pictures

Picture 16. Panoramic view of the constructed F4F pilot unit

2. **The turners' construction**

Two different types of turners have been constructed in order to help accelerate the drying process. A horizontal 5m long rotor which turns the pulp in the drying halls (this rotor covers all the width of the drying hall) and a vertical screw.

2.1. The horizontal drying turning system

This mixing, turning and transferring system is a horizontal inox screw proper for this quality of product. It has a number of motors and can rotate and move forward and back so as to turn and transfer the drying product and also can move up and down. More specifically, the movements that this drying turner can execute is one along the tank (can move forward and back), one relative to its height (up and down), i.e., a rotation of the shaft may be lifted and submerged, clockwise and counterclockwise. The combination of these movements and its automation contributes to the uniform stirring of the material and its transferability into the tank in order to create a row at the end of the tank to facilitate its removal. For the optimum operation of the drying system, the following program, as presented in Table below was created, based on which the electrician has applied the corresponding commands to the PLC of the central panel of the unit. It also has an electrical panel which is programmed to automatically move. In the pictures below photos from the construction of this turner are being presented.

Picture 17. During the construction of the inox horizontal turner

Picture 18. During transportation into the pilot unit

Picture 19. Placement on to the drying hall

For the automatic operation of the drying turner an electrical panel with a PLC has also been constructed and placed on the turner.

Picture 20. Construction of the electrical panel and a PLC of the horizontal turner

Picture 21. Placement of the electrical panel on the horizontal turner

Table 1. Automatic Program for the operation of the turner in coordination with the fans

Automatic Program for the operation of the turner			
	WINDOWS	**FANS**	**ROTOR**
8:00	OFF	OFF	OPEN FOR 10'
8:30	OFF	OFF	OPEN FOR 10'
9:00	OFF	OFF	OPEN FOR 10'
9:30	OFF	OFF	OPEN FOR 10'
10:00	OFF	OFF	OPEN FOR 10'
10:30	OFF	OFF	OPEN FOR 10'
11:00	OFF	OFF	OPEN FOR 10'
11:30	OFF	OFF	OPEN FOR 10'

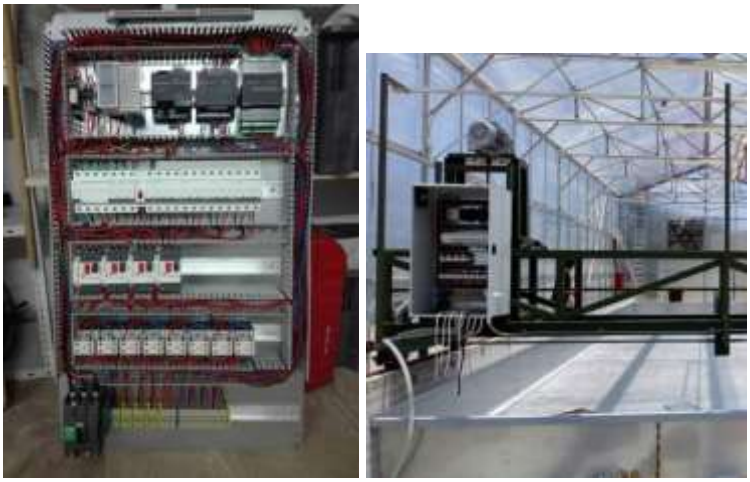
Automatic Program for the operation of the turner			
	WINDOWS	**FANS**	**ROTOR**
12:00	OPEN FOR 5'	OPEN FOR 5'	OPEN FOR 10'
12:30	OFF	OFF	OPEN FOR 10'
13:00	OPEN FOR 5'	OFF	OPEN FOR 10'
13:30	OFF	OFF	OPEN FOR 10'
14:00	OPEN FOR 5'	OPEN FOR 5'	OPEN FOR 10'
14:30	OFF	OFF	OPEN FOR 10'
15:00	OPEN FOR 5'	OFF	OPEN FOR 10'
15:30	OFF	OFF	OPEN FOR 10'
16:00	OPEN FOR 5'	OPEN FOR 5'	OPEN FOR 10'
16:30	OFF	OFF	OPEN FOR 10'
17:00	OPEN FOR 5'	OFF	OPEN FOR 10'
17:30	OFF	OFF	OPEN FOR 10'
18:00	OPEN FOR 5'	OPEN FOR 5'	OPEN FOR 10'
18:30	OFF	OFF	OPEN FOR 10'
19:00	OPEN FOR 5'	OFF	OPEN FOR 10'
19:30	OFF	OFF	OPEN FOR 10'
20:00	OPEN FOR 5'	OPEN FOR 5'	OPEN FOR 10'
20:30	OFF	OFF	OPEN FOR 10'
21:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
21:30	OPEN	OFF	OFF
22:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
22:30	OPEN	OFF	OFF
23:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
23:30	OPEN	OFF	OFF
0:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
0:30	OPEN	OFF	OFF
1:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
1:30	OPEN	OFF	OFF
2:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
2:30	OPEN	OFF	OFF
3:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
3:30	OPEN	OFF	OFF
4:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
4:30	OPEN	OFF	OFF
5:00	OPEN	OPEN FOR 5'	OPEN FOR 10'
5:30	OPEN	OFF	OFF
6:00	OPEN	OPEN	OPEN FOR 10'
6:30	OPEN	OPEN	OFF
7:00	OPEN	OPEN	OPEN FOR 10'
7:30	OPEN	OPEN	OFF

2.2. The vertical drying turning system

It is a horizontal axis, along of which a vertical screw can move. This drying system has the following moves. The screw can rotate clockwise and counterclockwise, it can also moves right and left along to the horizontal axis and this axis can also move front and rear at the length of the drying hall. Photos during the construction of this drying turner are being presented in the pictures below.

Picture 22. During the construction of the vertical drying system

Picture 23. During transportation and installation of the vertical turner into the pilot unit



Picture 24. Construction of the electrical panel and a PLC of the horizontal turner

Picture 25. The installed vertical drying turning system on the drying hall

3. The full operational solar drying pilot unit

3.1. A view plan for the constructed pilot unit

Picture 26. Panoramic view of the F4F pilot unit

3.2. An overview of the interior of the pretretment unit

Picture 27. An overview from the interior of the pretreatment unit

3.3. An overview of the interior of the solar drying unit

Picture 28. An overview from the interior of the solar drying unit, with the 2 drying systems