



LIFE Project Number
LIFE15 ENV/GR/000257

Mid-term Report
Covering the project activities from 01/09/2016¹ to
31/01/2019

Reporting Date²
28/02/2019

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



ANNEX 2

Sub-Annex 2.3.

Annex Data	
Action:	B1
Partner:	HUA
Title of Annex:	Deliverables of HUA
Title of Sub - Annex:	Deliverable B1.5: Food wastes collection cost estimation system
Main Description - Deliverables	Activity B.1.2.: Cost estimation methodology for the food wastes collection system

¹ Project start date

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

Table of contents

INTRODUCTION	2
COST ESTIMATION	3
RESULTS	4

Introduction

The growth in the standards of living of the population increases both the composition and quantity of wastes produced. Municipal wastes (or similar type waste) are required to be disposed of systemically with the aim of protecting human health and the environment. Food residues are generated in the process of daily life, manufacturing, trading, hospitality and other activities.

Collection is the beginning of the process of managing food residues (and generally waste), which includes, generation, collection, transfer, treatment and final disposal, and there are financial, management, legal, political and engineering functions in solid waste management. In almost all countries, local government has the responsibility for solid waste collection. Local authorities can privatise the collection service totally or partly or carry out the collection of wastes by directly employing their own labour. The responsibility of local government to ensure that public health is protected by carrying out a solid waste collection service places a financial and technical burden on the authorities.

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.

Food residues generated from the hospitality sector are generally not hazardous but constitute a high portion of total solid wastes. Food waste is highly biodegradable organics that may cause environmental, health, odour and aesthetic problems in urban life. Therefore, they need to be removed and disposed properly.

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. In this report 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". The main challenges (or problems) one might face while attempting to do so are a lack of cost data, and a lack of quality for what data do exist.

In this report, 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 elements of

collection cost, rate of collection cost compared with the total cost, the economic aspects of contracting out the collection service to the private sector and the feasibility of levying taxes regarding financing are evaluated and are compared to Local Authority costing.

To determine the present the collection and transport cost of food residues certain information is necessary. The required information, in order the collection and transport cost to be accurately determined includes:

- a) number of employees involved,
- b) number of vehicles,
- c) collection frequency,
- d) collection and transport distance.

Cost estimation

In order to estimate the total cost of the collection process the following parameters should be considered:

- The payload of the vehicle is 3 tonnes.
- The typical occupancy rate of the vehicle using methods discussed previously is 95%.
- The crew of the vehicle is the driver and two workers (one full-time and one part-time) who cost 1,300×2.5 euros per month.
- Employees work 40 hours a week for 48 weeks in a year.
- The amount of the food wastes produced by hotels is 100 tons.
- The cost of the fuel is 1.30 euros/lt and the vehicle needs about 30 lt/100km
- The cost to purchase the vehicle is 75,000 euros.
- The average distance of every trip for the vehicle is 30 Km. The total cost of the collection schema involves:
 - Total personnel cost = 2.5×1,300.00 = 3,250.00 euros per month
 - $Total\ fuel\ cost = (Total\ amount\ of\ food\ residues) / (Payload\ of\ vehicle) \times [Trip\ distance] \times [Fuel\ consumption] \times [Fuel\ cost]$

And so,

$$Total\ fuel\ cost = \frac{100\ tn}{3\ tn \times 95\%} \times [30\ km] \times \left[\frac{30\ lt}{100\ km} \right] \times \left[1.30 \frac{\text{€}}{lt} \right] = 410.5 \frac{\text{€}}{month}$$

- depreciation cost of the vehicle = 75,000 × 10% ÷ 12 = 625 euros per month
- insurance and maintenance of the vehicle = 300 euros per month

Results

$$\begin{aligned} & \textit{Total cost for collecting 100 tonnes food residues per month} \\ & = \frac{3,250 \text{ €} + 410.5\text{€} + 625\text{€} + 300\text{€}}{100 \text{ tn}} = \frac{4,855.5\text{€}}{100 \text{ tn}} \times = 48.55 \frac{\text{€}}{\text{tonne}} \end{aligned}$$

$$\textit{Total cost per tonne} = \mathbf{48.6} \frac{\text{€}}{\text{tonne}}$$

The cost of 48.6 € per tonne of collected and transported food residues is compared very favourably with the cost of the municipal collection service of about 100-110€ per tonne of municipal waste.

The estimated cost per tonne will be reviewed annually. The operational cost per tonne of the Solar/ Drying/ Pasteurisation pilot unit will be estimated after a typical full operation period (April-October 2019).