



# Output 5.3

## Statistical Report

### Pilots Italy-Jordan-Spain- Palestine

*This document/publication has been produced with the financial assistance of the European Union under the ENI CBC Mediterranean Sea Basin Program. The contents of this document are the sole responsibility of University of Vic – Central University of Catalonia and can under no circumstances be regarded as reflecting the position of the European Union or the Program management structures*

## Document Information

---

<b>OUTPUT</b>	<b>Number</b>	5.3	<b>Title:</b>	Statistical Report
<b>Work Package</b>	<b>Number</b>	WP5.	<b>Title:</b>	Statistical Report

<b>Semester of delivery</b>	VIII	<b>Target value</b>	1.0 Report
<b>Version number</b>	1.0		
<b>Format</b>	MS Office Word document		
<b>Creation date</b>	30/04/2023		
<b>Version date</b>			
<b>Dissemination Level</b>	PU Public	CO Confidential	
<b>Rights</b>	Copyright "DECOST Partnership". During the drafting process, access is generally limited to the DECOST partners		

<b>Responsible author</b>	<b>Name:</b>	Angelica Oviedo	<b>Email:</b>	Angelica.oviedo@uvic.cat
	<b>Partner:</b>	UVIC-UCC	<b>Phone:</b>	

<b>Other main author</b>	<b>Name:</b>	Joan Colon	<b>Partner:</b>	UVIC
	<b>Name:</b>	Mabel Mora	<b>Partner:</b>	UVIC
	<b>Name:</b>	Munir Rusan	<b>Partner:</b>	JUST
	<b>Name:</b>	Tahseen Sayara	<b>Partner:</b>	PTUK
	<b>Name:</b>	Francesco Fatone	<b>Partner:</b>	UNIVPM

<b>Brief Description</b>	This document describes the statistical results obtained during the execution of the DECOST project in the four pilots implemented in Italy, Jordan, Palestine and Spain.		
<b>Keywords</b>	Community composting, prevention, waste, municipality analysis, municipal solid waste, waste management.		
<b>Version log</b>			
<b>Rev. No.</b>	<b>Issue Date</b>	<b>Modified by</b>	<b>Comments</b>
1.0			
2.0			
3.0			

## Table of content

---

EXECUTIVE SUMMARY	7
OBJECTIVE 1: Reduce food waste and valorize 1,500-2,000 Tn of organic waste.	9
OBJECTIVE 2: Using compost produced in urban agriculture projects.	11
2.1. Spain	12
2.2 Italy	13
2.3 Palestine	15
2.4 Jordan	16
OBJECTIVE 3: Creating green jobs through DECOST teams.	18
OBJECTIVE 4: Training public administration personnel	20
OBJECTIVE 5: Use computer tools and mobile applications for citizen	24
OBJECTIVE 6: Addressing long-term municipal sustainability.	26
7. CONCLUSIONS	29
BIBLIOGRAPHY	30
ANNEX 1 Spain Pilot composter	33
ANNEX 2 Italy Pilot composter	1547
ANNEX 3 Jordan Pilot composter	257
ANNEX 4 Palestine composter	3567

## LIST OF TABLES

Tabla 1.	Valorization of organic matter and treatment capacity DECOST project	10
Tabla 2.	Types of installed composters.	10
Tabla 3.	Creation of green jobs through DECOST teams	18
Tabla 4.	Number of people benefited by country under the DECOST project.	26
Tabla 5.	Calculation of the treatment capacity and treated organic matter Spain.	8
Tabla 6.	Calculation of treatment capacity and treated organic matter Italy.	21
Tabla 7.	Calculation of the treatment capacity and treated organic matter Jordan.	29
Tabla 8.	Calculation of treatment capacity and treated organic matter Palestine.	40

## LIST OF FIGURES

Figura 1.	Valorization of organic wastes during the implementation (TN).	9
Figura 2.	Compost obtained during the implementation of the decost project (TN)	11
Figura 3.	Recovery of organic waste during the implementation	12
Figura 4.	Examples of urban agriculture gardens in the municipality of LMR	13
Figura 5.	Examples of urban agriculture gardens in Italy and of compost obtained.	15
Figura 6.	Example of Urban Agriculture Gardens in Palestine and distribution of compost	15
Figura 7.	Example of urban agriculture gardens in Jordan, the irrigation system compost.	17
Figura 8.	Example New green jobs created.	19
Figura 9.	Examples training waste management strategies.	21
Figura 10.	Examples training in operation, maintenance, and monitoring of composters.	22
Figura 11.	Example Training for Jurosom Agricultural Society	22
Figura 12.	Training technical staff of Al Sarow Municipality	23
Figura 13.	Training for female Sma School and Training for male Sam School	23
Figura 14.	Decost website.	24
Figura 15.	Decost project application Palestinian.	25
Figura 16.	Example application Project DECOST Spain	25
Figura 17.	Map of Catalonia-Region of Osona-	33
Figura 18.	Distribution of composters by neighborhood.	34
Figura 19.	4 Line composting located in neighborhood Vicentç, Casas del Vicentç spot	35
Figura 20.	5 Line composting located in neighborhood Fontanelles, Parque spot	36
Figura 21.	3 Line composting located in neighborhood Casas nuevas, Industria spot	37
Figura 22.	Percentage of organic matter before and after DECOST project.	38
Figura 23.	Composting point of 6 lines Barrio Sant Llatzer	39
Figura 24.	Organic matter treated according to number of composters	40
Figura 25.	Amount of organic matter before and after the DECOST project	41
Figura 26.	Contribution of community composting:	12
Figura 27.	Information collection monthly weights of organic matter treated	123
Figura 28.	Physicochemical results of the compost	44
Figura 29.	Final concentration limits of heavy metals	45
Figura 30.	Map of Italy- Its regions and cities of Potenza and Atella.	46
Figura 31.	Composter Ecopans two chamber system Data	47
Figura 32.	Composter City Net Rotating chamber system	49
Figura 33.	Amount of organic matter treated before and after	50
Figura 34.	Community Composter City Net. Rotatin chamber system	52
Figura 35.	Community Composter Ecopans two chamber system	53
Figura 36.	Urban agriculture projects initiated by the NGO	54
Figura 37.	Information collection monthly wieghts of organic matter treated	55
Figura 38.	Information collection monthly weights of organic matter treated	56
Figura 39.	Map of Jordan Its regions and cities of Al-Sarrow.	57
Figura 40.	Home Composter installed in Jordan.	58
Figura 41.	Home Composter delivered in Jordan.	59
Figura 42.	Amount of organic matter treated before and after the DECOST project.	60
Figura 43.	Design of the Urban Agriculture model applied in Jordan	61

Figura 44. Citizen operating the irrigation system for the UA 62

Figura 45.	Mayor of Al Sarow Municipality	63
Figura 46.	Installing irrigation system for UA	64
Figura 47.	Greenhouse experiment	65
Figura 48.	Positive effect of compost on plant growth	65
Figura 49.	Positive effect of compost on organic matter	66
Figura 50.	Map of Palestine	67
Figura 51.	Cylinder home composters 360º	68
Figura 52.	Cylinder Community composters 360º	69
Figura 53.	Amount of organic matter treated before and after the Decost project	70
Figura 54.	Cylinder Community composters 360º	71
Figura 55.	Home composting 360º	72
Figura 56.	Characterization of organic matter	73
Figura 57.	Physical-chemical analysis of organic matter	74

## EXECUTIVE SUMMARY

---

The general objective of the DECOST project was to develop, implement and validate a new model for the collection and treatment of the organic fraction of municipal solid waste (MSW) based on decentralized composting of households and communities, closely integrated with urban agriculture projects, to move towards a circular economy approach. The project met the objective of implementing holistic and integrated land management processes to increase economic, social, and territorial cohesion and reduce pressures on the environment, promoting the participation of civil society, scientists and local communities and other stakeholders in the governance process at all levels.

To achieve these goals, the main activities of the DECOST project were oriented towards the fulfillment of six specific objectives:

- (i) reduce food waste and valorize 1,500-2,000 tons of the organic fraction of municipal solid waste
- (ii) use the compost produced in urban agriculture projects
- (iii) create green jobs through DECOST equipment
- (iv) train public administration personnel
- (v) use digital tools and mobile applications for citizen science and engagement
- (vi) address long-term municipal sustainability

Therefore, this document addresses the development and the statistical numbers related to each of the project pilots, as well as other relevant statistics such as the installed capacity for the treated organic matter, the compost obtained, the urban agriculture projects benefited and the impact generated compared to a new management model compared to the existing one, as well as the long-term results obtained through the development of the 4 pilot initiatives in small towns and neighborhoods of large cities in the countries of Jordan, Italy, Spain and Palestine.

The following table summarizes the main results obtained from the DECOST project:

DECOST goal	DECOST final output
valorize 1,500-2,000 t of OFMSW	<b>4 pilots</b> were installed with a total annual <b>OFMSW treatment capacity of 1,164 Tn/year</b> . More than 1,000 Tn/year of OFMSW were treated
use the compost produced in urban agriculture projects	Around <b>677 tons of compost</b> were obtained. More than <b>3750 people</b> used the compost in their own gardens or in municipal/urban gardens.
create green jobs	<b>67 green jobs were created.</b>

	To give continuity to the project, The participating pilot municipalities <b>have created 7 long-term green jobs.</b>
train public administration personnel	During the execution of the DECOST project, <b>49</b> trainings were carried out <b>for public administration personnel</b> in relation to waste management strategies and operation, maintenance, and monitoring of the installed composters.
use digital tools and mobile applications for citizen science and engagement	<b>2</b> applications were developed in two countries: <b>Palestine and Spain</b>
address long-term municipal sustainability	<ul style="list-style-type: none"> <li>• <b>4 management plans</b> in the countries of Palestine, Jordan, Italy, and Spain.</li> <li>• <b>3520 citizens</b> participated in raising awareness campaigns on environmental issues.</li> <li>• <b>92 educational activities</b> with young people and kids in urban agriculture and gardening</li> </ul>



## OBJECTIVE 1: Reduce food waste and valorize 1,500-2,000 Tn of organic waste.

During the execution of the DECOST project, **4 pilots** were installed with a total annual **OFMSW treatment capacity of 1,183 Tons/year**. More than 1,000 Tons/year of OFMSW were treated.

Through the development of 4 pilots (deliverable WP3 & WP4) in the countries of Palestine, Jordan, Italy and Spain, different types and numbers of composters were installed for a total installed capacity of 1,680 tons / throughout the project and a total of treated organic matter of 1000 tons/year. The following graph shows the treated Organic Fraction of Municipal Solid Waste (OFMSW) by country.

It should be noted that the quantities treated in each pilot depends on (i) the installed treatment capacity which in turns depends on the per capita production and the composition of the municipal solid waste (e.g., % of organic waste into the municipal solid waste) and (ii) the involvement of the citizens in the source-separation and valorization of the OFMSW.

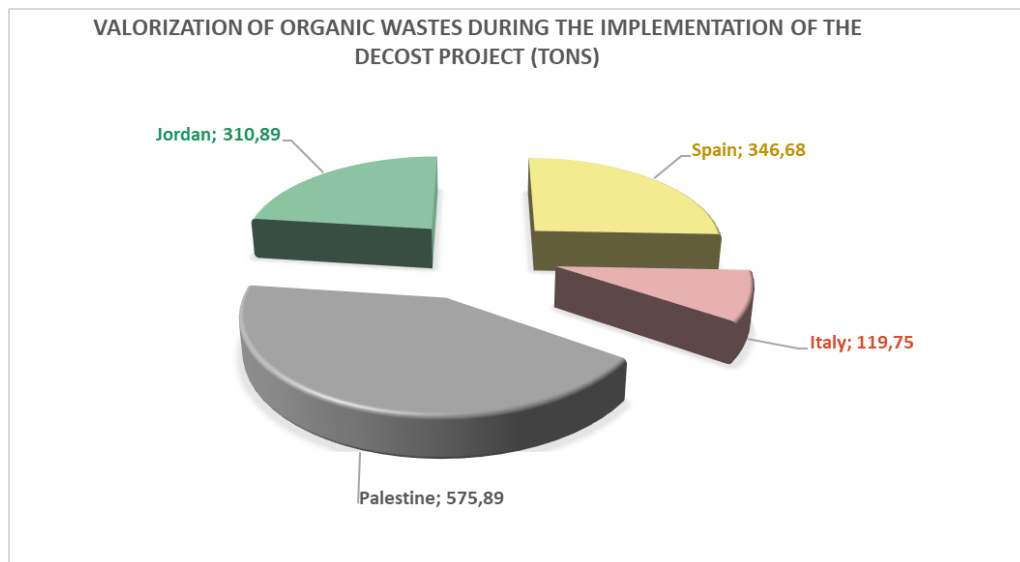


Figura 1. VALORIZATION OF ORGANIC WASTES DURING THE IMPLEMENTATION OF THE DECOST PROJECT (TN).  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

\*To calculate the total organic matter treated during the entire project, we considered the duration of the composting process or cycle (3 months), the organic matter treated per cycle and the number of months of operation of the composters per country.

In the following table you can see the amount of organic matter by cities and / or neighborhoods where the composters were implemented, as well as their treatment capacity.

SPAIN			
Valorization of organic wastes	Les Masies de Roda	Vic	TOTAL
Treated organic matter	92,78	31	123,65
Treated pruning	9	10,8	19,80
<b>Total treated organic matter + pruning</b>	<b>102</b>	<b>42</b>	<b>143,45</b>
<b>Total Treatment capacity</b>	<b>209,04</b>	<b>88,21</b>	<b>297,25</b>
ITALY			
Valorization of organic wastes	Potenza	Atella	TOTAL
Treated organic matter	30,00	70	99,75
Treated pruning	10,00	10,00	20,00
<b>Total treated organic matter + pruning</b>	<b>40,00</b>	<b>80</b>	<b>119,75</b>
<b>Total Treatment capacity</b>	<b>40,00</b>	<b>80,00</b>	<b>120,00</b>
PALESTINE			
Valorization of organic wastes	Anabta	Kruf Rumman	TOTAL
Treated organic matter	18,00	307	324,60
Treated pruning	10,00	31	40,66
<b>Total treated organic matter + pruning</b>	<b>28,00</b>	<b>337</b>	<b>365,26</b>
<b>Total Treatment capacity</b>	<b>28,00</b>	<b>544,00</b>	<b>572,00</b>
JORDAN			
Valorization of organic wastes	Al-Sarrow		TOTAL
Treated organic matter	140,64		140,64
Treated pruning	14,80		14,80
<b>Total treated organic matter + pruning</b>	<b>155,45</b>		<b>155,45</b>
<b>Total Treatment capacity</b>	<b>174,80</b>		<b>174,80</b>
All countries			
Valorization of organic wastes	One year	All the project	TOTAL
<b>Total treated organic matter + pruning</b>	<b>783,91</b>	<b>1353</b>	<b>1353</b>
<b>Total Treatment capacity</b>	<b>1164,06</b>		

\* Units= (Tn/year)

Tabla 1. Valorization of organic matter and treatment capacity DECOST project  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

### Type of Composters installed.

The following table and photographs show the type of composters installed by each country.

Country	City	Type of Composter						
		Community Composting Modular	chamber system	Home with self composting	Community Composting Cilindric	Composter for Women and Youth NGOs	Composters for Male and Female schools	For Graduate student research
Spain	LMR	X						
	Vic	X						
Italy	Potenza		X					
	Atella		X					
Palestine	Anabta			X	X			
	Kurf Rumman			X				
Jordan	Al-Sarrow			X		X	X	X

Tabla 2. Types of installed composters.  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

## OBJECTIVE 2: Using compost produced in urban agriculture projects.

During the execution of the DECOST project, around **677 tons of compost** were obtained.

More than **3750 people** used the compost in their own gardens or in municipal/urban gardens.

The DECOST project was able to demonstrate how innovation in decentralized composting is available in cities and/or small neighborhoods as a real alternative to centralized composting or final treatments such as incineration and landfilling. Through the execution of the DECOST project, it was evidenced how the new organic fraction treatment system includes a people-centered approach in which citizens have assumed the

central role in the valorization and reuse of organic waste through the coupling of H&CC to urban agriculture projects.

Within the framework of the Decost project, a total of 1680 tons of organic matter were treated, and around 850 tons of compost were obtained, whose generation by country is shown in the following graph. The compost was distributed to the citizens of each city and / or municipality where community composting was implemented, through different activities such as urban agriculture projects, workshops in schools and other spaces of citizen interest.

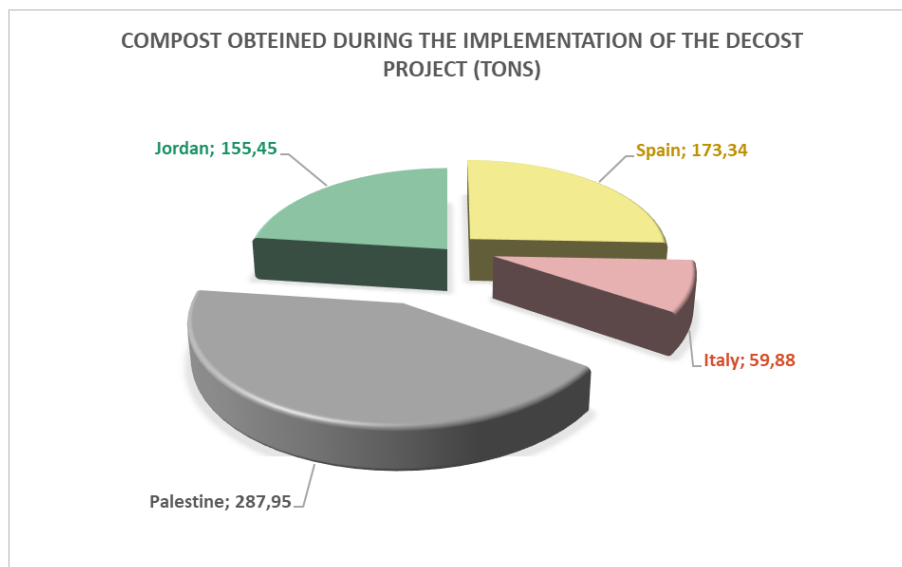


Figura 2. Compost obtained during the implementation of the decost project (TONS)  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

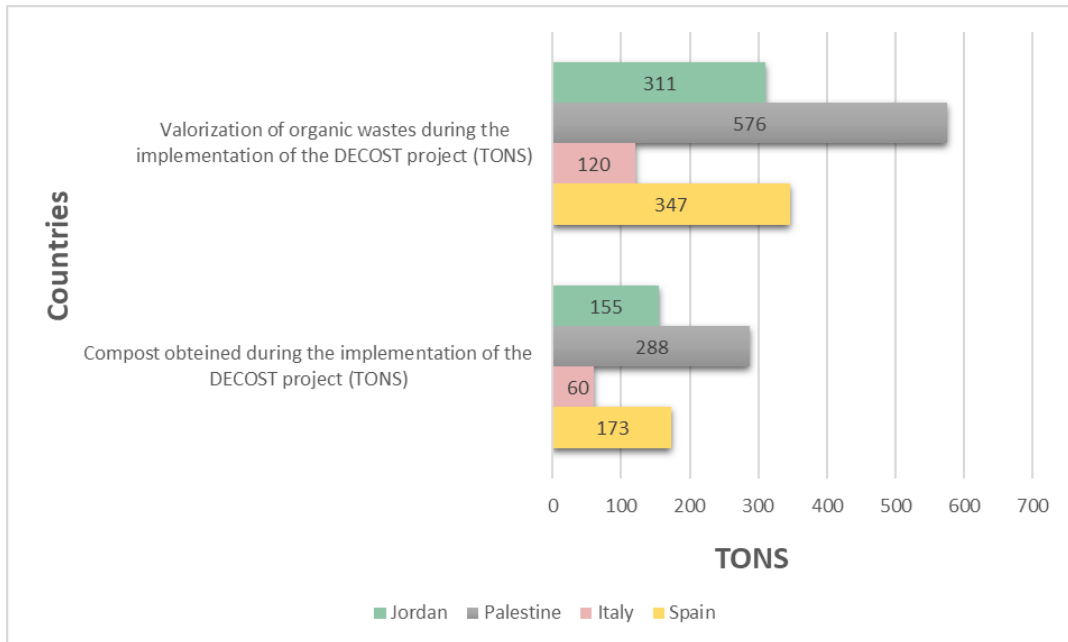


Figura 3. Recovery of organic waste during the implementation of the decost project (tn) vs compost obtained by country. Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

### 2.1. SPAIN

One of the selection criteria of the municipality of -LMR - and the Barrio Sant Llatzer are its characteristics by type of municipality, in the case of LMR this is classified as rural, since the houses of this municipality have orchards, where the neighbors have their own crops for their own supply. Something similar happens with the Barrio Sant Llatzer, where the neighbors have gardens that allow them to have crops.





Figura 4. Examples of urban agriculture gardens in the municipality of Imr and distribution of compost obtained: DECOST Project (UVIC-Beta Technology Center)

## 2.2 ITALY

Potenza has a large municipal area that includes several scattered small towns where H&CC was the best decentralized solution. Finally, the compost produced was used by the urban agriculture project that was preliminarily initiated by Legambiente Associazione Legambiente Circolo di Potenza "Ken Saro Wiwa APS" (Italy's largest environmental NGO) in the suburbs of Potenza and worked very well with decentralized community composting provided by DECOST.

On the other hand, the surrounding area of Atella, is rich in green parks and water sources, is characterized by lush vegetation and cultivated land. The territory of the municipality of Atella includes the lakes of Monticchio, a popular natural park included in the main tourist routes of the Basilicata region. The main activities in Atella are related to agriculture, with a relevant production of wine and oil, so the community of Atella also benefits from the compost obtained for its crops.





Figura 5. Examples of urban agriculture gardens in Italy and distribution of compost obtained.

Data Source Provider: DECOST Italy Project (UVIC-Beta Technology Center)

### 2.3 PALESTINE

Considering that the composters are installed in the garden of each home, the composting obtained was used by the same citizens for their urban gardens. As for the community composter, the compost produced is used in the fertilization of public gardens, roundabouts, and school gardens, while the rest of the compost will be distributed to farmers in Anabta, for fertilization of cultivated land. These urban agriculture crops contributed to the supply of food needs because only 25% of the residents' needs are met by urban agriculture, and the rest is imported from nearby cities in Palestine, due to the absence of specific plans to develop urban agriculture. This is why the community compost produced is a great opportunity to improve the quality of soil on cultivated land and increase the sufficiency of agriculture in the city and green land areas. In addition, in relation to the production of community compost, a variable crop aggregation plan was carried out in collaboration with the owners of the land, to approach the optimal self-sufficiency and food security of the locality.



Figura 6. Example of Urban Agriculture Gardens in Palestine and distribution of compost obtained. Data Source Provider: DECOST Palestine Project (UVIC-Beta Technology Center)

## 2.4 JORDAN

The houses where the home composters were distributed, were divided into two groups: with backyards / garden or Without backyard / garden: The compost produced was used in urban agriculture projects such as soil amendments and fertilizers. In addition, composters were also distributed to 16 NGOs including Female Charitable Societies and Youth Societies located in the pilot site in Jordan.

In addition to the production of compost, as an additional result in the operation of urban agriculture, irrigation systems were implemented in this model by capturing (harvesting) rainwater from the rooftop of buildings of the houses.







Figura 7. Example of urban agriculture gardens in Jordan, implementation of the irrigation system and distribution of compost obtained.

Data Source Provider: DECOST Jordan Project (UVIC-Beta Technology Center)

## OBJECTIVE 3: Creating green jobs through DECOST teams.

During the implementation of the DECOST project, **67 green jobs were created.**

To give continuity to the project, The participating pilot municipalities **have created 7 long-term green jobs.**

The creation of jobs is divided into two groups: The first group corresponds to the jobs (67) created by the universities and other project partners, during the implementation and execution of the DECOST project, which consist of principal investigators, senior, technicians, project, and communications managers. These positions performed activities related to administrative and financial management, as well as implementation, operation, maintenance, monitoring

and outreach activities, awareness of home and community composting.

These personnel have been classified into three groups by type of dedication, being long-term three years or more, medium-term between one and two years and short-term one year or less. The distribution of personnel employed by the DECOST project can be seen in the following table.

The second group corresponds to the jobs (7) created by the municipality of each country to give continuity to the project, especially in the activities of daily field work, such as the operation, maintenance of composters and delivery of compost. These full-time, long-term jobs are incorporated as municipal employees.

Creation of green jobs through DECOST teams					
Country	Jobs created during the implementation of the DECOST project				Works created by the municipality for the continuation of the DECOST project
	*Long term	**Medium term	***Short term	Total jobs	
Spain	4	4	1	9	3
Italy	6	3	4	13	1
Palestine	5		8	13	2
Jordan		25	7	32	1
<b>Total</b>	<b>15</b>	<b>32</b>	<b>20</b>	<b>67</b>	<b>7</b>

\* 3 and a half

\*\* Between one and two years

\*\*\* One year or less

Tabla 3. Creation of green jobs through DECOST teams Data Source Provider: DECOST Project (UVIC-Beta Technology Center)



Figura 8. Example New green jobs created.  
Data Source Provider: DECOST Jordan Project (UVIC-Beta Technology Center)

## OBJECTIVE 4: Training public administration personnel

During the implementation of the DECOST project, **49 people were trained through 132 training courses for public administration personnel on waste management strategies and the operation**, maintenance, and supervision of the installed composters.

The training focused on how to effectively operate the system (to obtain a high-quality compost with a low gaseous emissions profile). They also received training on how to conduct information campaigns and on how to collaborate/involve citizens in the functioning of the system.

Each team was supervised/trained by experts from the DECOST project of each pilot site, composed of

people from Universities and Municipalities of the region (partners) and a multidisciplinary team trained to manage the entire system.

Each country carried out accompaniment activities, trainings to train the personnel responsible for continuing with the community and home composters.

Country	Profile	Number of people trained per topic				
		Waste management strategies	Operation	Maintenance	Transfer	Monitoring
Spain	Administrative staff	8				
	Technical staff		5	5	5	5
Italy	Administrative staff	4				
	Technical staff		2	2		2
Palestine	Administrative staff	4				
	Technical staff		2	2		2
Jordan	Administrative staff	4				
	Technical staff		20	20	20	20

Trainings performed. Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

The administrative staff received training related to waste management strategies, which included information related to the distribution of personnel, dedication of time, assignment of tasks, among others.

As for the technical staff, the training focused on the operation, maintenance, transfers, and monitoring of the composters, where in addition to the training, an accompaniment was carried out for six months. Many training workshops for stakeholders including Citizens, NGOs, government bodies, schools has been conducted, like to see in the follow pictures:



Figura 9. Examples training waste management strategies Spain-Italy-Palestine and Jordan.  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)





Figura 10. examples training in operation, maintenance, and monitoring of composters.  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)



Figura 11. Example Training for Bani Kenana Widows Association and Training for Jurosom Agricultural Society  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)



Figura 12. Training technical staff of Al Sarow Municipality on Sampling and classification of municipality wastes and Training for Almanara Women Society  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)



Figura 13. Training for female Sma School and Training for male Sam School  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

## OBJECTIVE 5: Use computer tools and mobile applications for citizen science and Commitment

During the execution of the DECOST project, **2** applications were developed in two countries:

**Palestine and Spain**

During the execution of the DECOST project, two applications were developed: One for Palestine and Jordan and another one for Spain, the detail of the development of these applications was presented in deliverable number 4, however, a summary of the operation of the applications is presented.

These tools were developed with the aim of maintaining easy and fluid communication between the Municipality and users, through the web and mobile applications.

### 5.1 PALESTINE

1-Developed a web-based application designed and developed to work on desktops and laptops. Its main purpose is to inform users with a selective collection of information and common composting services of the Municipality, where it can transmit information to users and at the same time receive and collect information from them.



Figura 14. Decost website. Source: DECOST Palestine Project(UVIC-Beta Technology Center)  
Data Source Provider: Palestinian DECOST Project(UVIC-Beta Technology Center)

2- In the same way, a mobile application that works on Android and Apple mobile devices was developed, so that users can easily download it, aimed at owners and users of DECOST composters, where they can receive information, announcements, questionnaires, and other materials necessary to keep their composters functional. This application also allows communication between the Municipality and users.





Figura 15. Decost project application Palestinian.  
Data Source Provider: Palestinian DECOST Project(UVIC-Beta Technology Center)

## 5.2 SPAIN

The WEB app was developed to inform and communicate to users of the selective collection and community composting service of Les Masies de Roda.

The application was developed in Web environment and the applications are published in Android to allow access to the camera device, in case of direct access by Web access will be replaced by the attach file button.

The APP is open to citizens. When logging in, the user answers a small questionnaire to enter the socioeconomic data to later perform specific calculations associated with the weight contributed by the users, among other information. Additionally, the application offers the following services:

Information for users: Recent communications, solid waste collection information, compost delivery information, informative social media page and link to Web data, collection time (for solid waste other than the organic fraction).

Incidents: (incidents sent by the user to the City Council) or Incident Register, reason (odors, other waste in the area, complete composter). The incidents allow to report with comments, geolocation, images, which can be classified as answered or not.

On the other hand, an Intranet platform was developed for the municipality, which allows the following most outstanding services: Communications, list of user incidents and requests made by citizens.

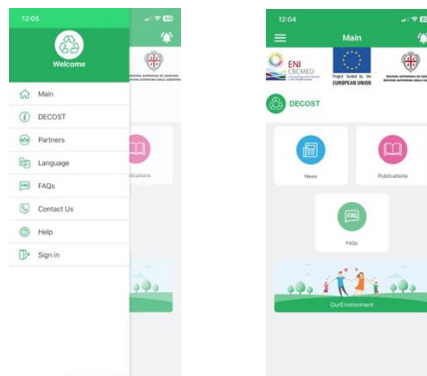


Figura 16. Example application Project DECOST Spain

## OBJECTIVE 6: Addressing long-term municipal sustainability.

The DECOST project, developed and implemented:

- **4 management plans** in the countries of Palestine, Jordan, Italy, and Spain.
- **3520 citizens** participated in raising awareness campaigns on environmental issues.
- **92 educational activities** with young people and kids in urban agriculture and gardening

The objectives set out in the framework of the DECOST project have allowed the prevention and recovery of waste generated in places where there was not even source-separation and in other contexts problems have been solved due to inadequate waste management and/or improvements in source-separation, whose benefits translate into social, economic, and environmental aspects as demonstrated in these reports. These benefits will be further explained in the sustainability report.

Additionally, after the end of the project, DECOST is proud to announce that all the municipalities participating in the project will continue the long-term operation of the developed waste management plans and the home/community composters initiatives. This result shows that the municipalities and its citizens are satisfied with the results of the project implementation. This continuity is viable thanks to the initial investment made by the ENI program.

The DECOST project addressed the needs of each municipality considering the initial diagnosis and DECOST has provided solutions from an economic, social and environmental point of view (e.g., in-situ composting, knowledge transfer & capacity building and raising awareness & educational campaigns). The following table shows the numbers of relevant information linked to the DECOST activities that have contributed to the long-term sustainability of the project by providing real and tangible returns to the citizens.

Activities related to the use of compost and urban agriculture	Participants				
	Spain	Italy	Palestine	Jordan	TOTAL
Number of people benefiting from the compost	940	970	1200	676	<b>3786</b>
Number of people involved in urban agriculture projects	700	200	350		<b>1250</b>
Number of urban agriculture project or home agriculture	350	2	100		<b>452</b>
Number of educate citizens on environmental issues	2490	1000	30		<b>3520</b>
Number of specific activities developed for kids	156	3	10	8	<b>177</b>
Number of comunity gardens	1	2	3		<b>6</b>
Number of educational gardens activities	1	1	5	85	<b>92</b>
Number of urban gardens lots		35			<b>35</b>
Perception survey				100	<b>100</b>
Project perception survey				45	<b>45</b>
<b>total number of activities carried out</b>	<b>4638</b>	<b>2178</b>	<b>1698</b>	<b>769</b>	<b>9463</b>

Tabla 4. Number of people benefited by country under the DECOST project.  
Data Source Provider: DECOST Project (UVIC-Beta Technology Center)

Moreover, the development of these management plans followed a new framework that incorporated an innovative approach to organic waste recovery, in line with the Waste Directive 2008/98/EC and region-specific regulations (e.g., PRECAT in Spain, contributing to the adaptation of territories to the Urban Agenda, Circular Economy Package, Sustainable Development Goals, Paris Agreement on climate change, and RIS3 strategies for smart specialization). The participation of National Waste Agencies has facilitated the transfer of generated knowledge to national Waste Management Plans and policies.

Consequently, DECOST has effectively achieved its objective of establishing a new waste management framework by creating a closed-loop system for organic waste recovery, integrating decentralized Household and Community Composting (H&CC) systems with Urban Agriculture. This approach encompasses the following key aspects:

- (i) Reducing the generation of organic waste and diverting it from landfills by promoting the implementation of a new organic waste treatment model based on H&CC. The model emphasizes waste reduction and source separation across all waste fractions, including organics, paper, and plastic.
- (ii) Implementing holistic and integrated spatial planning processes to enhance economic, social, and territorial cohesion, while alleviating environmental pressures. The participation of civil society, scientists, local communities, and other stakeholders at all levels is actively encouraged in the governance process.
- (iii) Maximizing the utilization of organic components in municipal waste through the promotion of urban agriculture projects that serve multiple urban purposes, such as greening, food security, food accessibility, food literacy, job training, employment, and community building.

Finally, the project has been carefully structured to ensure long-term sustainability beyond its completion. The municipalities and municipal organizations involved in the project, whether as partners or associate partners, bear the responsibility for sustaining the pilot schemes, as municipal waste management falls under their jurisdiction."

## 7. Conclusions

- By implementing a new collection system, either in all fractions or only in the organic fraction and a new management of treatment of the organic fraction through community composting, a more rational management of waste was obtained, as evidenced by the increase in the rate of selective collection and in the increase in the organic fraction separated at the source and subsequently treated to obtain compost.
- The community compounding treatment system to treat the organic fraction proved to be a sustainable system, as discussed during the document with the relationship of environmental, social, and economic benefits.
- The separation at the source of the organic fraction allowed the increase of the percentages regarding the treatment of this fraction. These results have a positive impact for the goals established by the municipality to achieve a greater use of organic matter, even marking a beginning for places where there is no separation at the source.
- The successful results in the DECOST project in relation to the treatment of the organic fraction, use of compost in urban agriculture projects, the creation of new jobs, the development of apps, staff training and the design of sustainable management plans, make this project an example of replicability in places that have characteristics like municipalities and / or neighborhoods to those mentioned in this report.

*This document/publication has been produced with the financial assistance of the European Union under the ENI CBC Mediterranean Sea Basin Program. The contents of this document are the sole responsibility of University of Vic – Central University of Catalonia and can under no circumstances be regarded as reflecting the position of the European Union or the Program management structures*

# Bibliography

---

- AdminStatItaly. (2023). *Maps, analysis and statistics on the resident population*. Obtenido de <https://ugeo.urbistat.com/AdminStat/it/it/demografia/famiglie/potenza/76063/4>
- Waste Agency of Catalonia. (2020). *Waste Agency of Catalonia* . Obtained from Agencia de Residuos de Catalunya : [http://residus.gencat.cat/web/.content/home/ambits\\_dactuacio/planificacio/precat20\\_resum\\_executiu\\_es.pdf](http://residus.gencat.cat/web/.content/home/ambits_dactuacio/planificacio/precat20_resum_executiu_es.pdf)
- Waste Agency of Catalonia. (2018). Retrieved from <http://estadistiques.arc.cat/ARC/#>
- Waste Agency of Catalonia. (2021). Retrieved from <http://estadistiques.arc.cat/ARC/#>
- Ayuntamiento Les Masies de Roda. (2023). *Les Masies de Roda Town Council*. Obtained from <https://www.lesmasiesderoda.cat/>
- City Council of Vic. (2020). *Report of Results of waste collection in Vic*. Vic.
- City Council of Vic. (2023). Retrieved from <https://www.vic.cat>
- Municipality of Potenza. (2018 - a). Council Resolution no. 7 of 26/02/2018. *Financial plan waste tax*.
- The world order. (2021). *EOM*. Retrieved from <https://elordenmundial.com/mapas-y-graficos/mapa-politico-italia/>
- European Environment Agency. (2016). *Municipal waste management*.
- Eurostat. (08 of 02 of 2021). *Eurostat*. Retrieved from <http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do>
- Giunta, Basilicata Region. (2011). Resolution No. 1150 of 28/07/2011. *Favorable opinion of environmental compatibility and update of the AIA, with regard to the "Integrated platform for the disposal of non-hazardous waste located in Cafaro in the municipality of Atella (PZ)"*.
- I.Stat. (2023). *I.Stat*. Obtained from [http://dati.istat.it/Index.aspx?DataSetCode=DCIS\\_POPRES1#](http://dati.istat.it/Index.aspx?DataSetCode=DCIS_POPRES1#)
- Cartographic Institute of Catalonia. (2022). Retrieved from <https://geografiabatxillerat.wordpress.com/material-addicional/mapa-de-comarques-de-catalunya/>
- ISPRA. (2019). *Municipal Waste Report*.
- Istituto Superiore per la protezione e la ricerca ambientale. (2023). Obtenido de % of landfilled waste without pre-treatment in the Italian Regions

Ministry for the ecological transition and the demographic challenge. (2018). *Annual report of generation and management of waste of municipal competence.*

Ontheworldmap. (2023). *Ontheworldmap*. Retrieved from <https://ontheworldmap.com/palestine/>

UVIC-Beta Technology Center. (n.d.). *Baseline Scenario Spain*. 2020.

Vermican. (2020). Retrieved from <https://ecompostaje.com/>

Wikipedia. (2023). Retrieved from <https://es.wikipedia.org/wiki/Osona>



# ANNEX 1

## Statistical Report Pilots Spain

# ANNEX 1

## 1. Spain Pilot composter

### 1. 1. Introduction

In Spain, specifically in the Autonomous Community of Catalonia, two pilots were developed for community composting: The first in the municipality of Les Masies de Roda and the second in the Barrio de Sant Llatzer in the municipality of Vic.

Both sites are in the Osona region, 90 km from Barcelona. The characteristics of each site, as well as the installed pilots are described below. The map of the Autonomous Community of Catalonia shows the location of the Osona region, in which LMR and Vic are located.

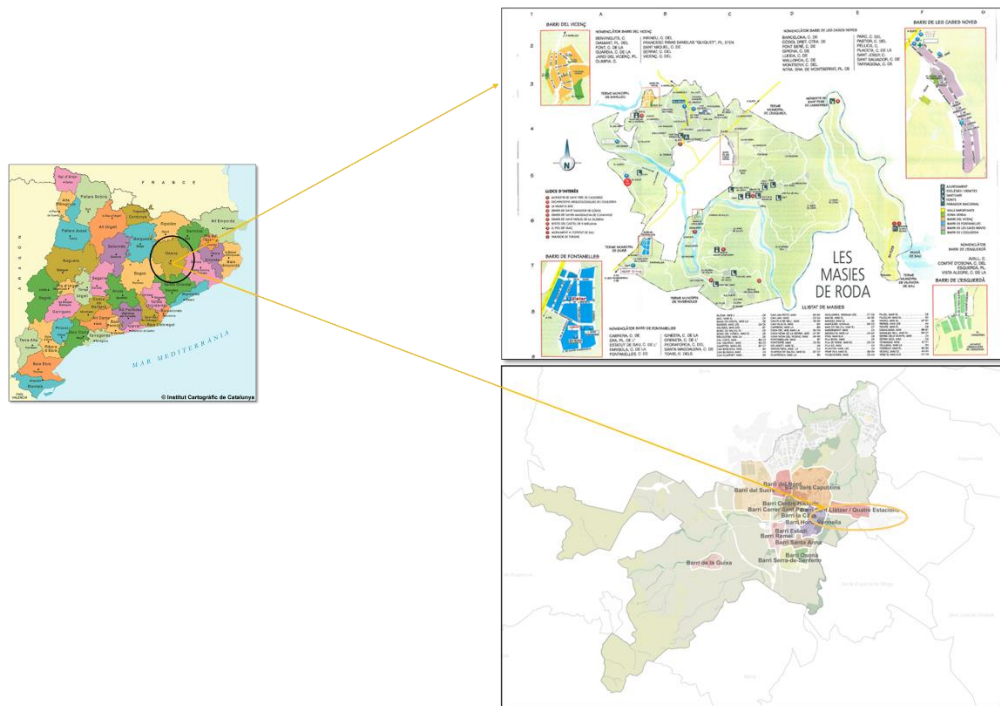


Figura 17. Map of Catalonia-Region of Osona- Les Masies de Roda and Barrio Sant Llatzer Vic

Source: (Cartographic Institute of Catalonia, 2022)(Ayuntamiento Les Masies de Roda, 2023)(Vic City Council, 2023)

1.1.1 Les Masies de Roda -LMR: It is a rural and dispersed municipality where houses with gardens or neighborhoods with green areas predominate. Therefore, this municipality meets all the criteria (low-density residential area, green areas, availability of pruning and gardening waste) required to install an H&CC system to treat most of the organic fraction of municipal waste -OFMSW- generated in the city MRL. You can see on the map, that the neighborhoods of Les Masies de Roda are surrounded by green areas and crops.

*This document/publication has been produced with the financial assistance of the European Union under the ENI CBC Mediterranean Sea Basin Program. The contents of this document are the sole responsibility of University of Vic – Central University of Catalonia and can under no circumstances be regarded as reflecting the position of the European Union or the Program management structures*



1.1.2 Sant Llatzer Neighborhood – Vic: It is the capital of the region of Osona, has 14 neighborhoods, of which the neighborhood of Sant Llatzer was selected to treat organic matter from community composting voluntarily, since the homes of this neighborhood have green areas, parks, and gardens, which are used by neighbors for the development of their crops.

## 1.2 Waste production

This numeral lists the most relevant information such as population, generation per capita, among others that allow to know the generation of waste in the municipalities in which the pilots were developed.

### 3.2.1 Residue production in MRLs

Les Masies de Roda has a low population density (42.7 inhabitants per km<sup>2</sup>) with a total of 704 inhabitants in 2021 and 514 dwellings. The per capita generation corresponds to 1.3 kg/inhabitant/day, between 28 to 33% organic matter.

### 1.2. 2 Waste production in VIC-Barrio Sant Llatzer

The neighborhood Sant Llatzer 1,687 inhabitants in 2021 inhabitants. The per capita generation corresponds to 1.28 kg/inhabitant/day, being 28% organic matter.

## 1.3. Waste recovery

In Spain, a total of 87 community composters were installed, distributed in two different points: 63 community composters in 14 different points distributed in the 4 four neighborhoods of the Municipality of Les Masies de Roda -LMR- and 24 community composters in the neighborhood of Sant Later Ciudad de Vic . In this way it was possible to treat the organic matter generated and its subsequent obtaining of compost. For a total treatment capacity of 297 Tn/year. As for the tons of organic matter treatment, it should be noted that these have been assumed considering the filling capacity of the composters, allowing an approximate value to be calculated.

Each module is designed in recycled plastic and the lid in polyester, which also has a lid with individual access to maximize the user experience when it comes to the contribution of organic matter. All walls can be removed by removing boards at will to provide the best access to maintenance tasks, including the transfer of organic matter from the input composters to the maturation composters.

Each point has a variation in the number of composters: 6, 5, 4 and 3. Which differ in the number of contribution and maturation modules, being the contribution where citizens dispose of their organic matter in compostable bags that are subsequently opened and mixed with dry structuring; as for the maturation module, these are used in order to continue with the process of decomposition of organic matter, which is 12 weeks.

### 1.3.1 LMR

The municipality of LMR is composed of four districts: Fontanelles, L'Esquerda, Les Cases Noves and Vicenç. The community composters were distributed as shown in the following diagram in the 4 neighborhoods, for a total of 63 composters installed. The figure below shows the location

of composters in each of their neighborhoods and their total number, and the table shows the distribution of composters by location.

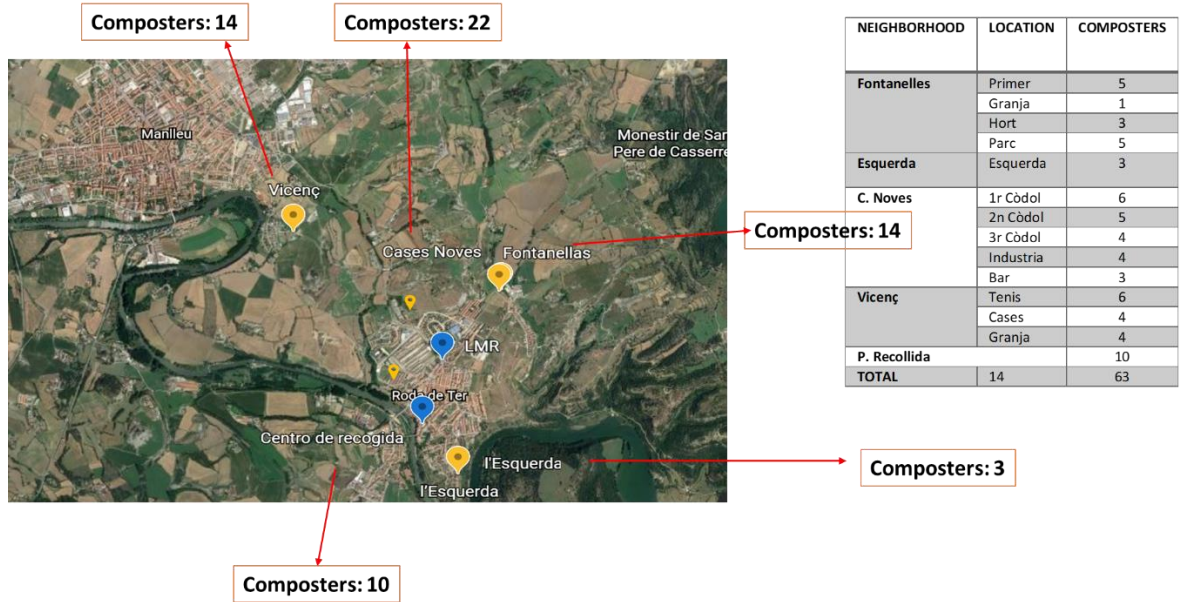


Figura 18. Distribution of composters by neighborhood.  
Source: DECOST SPAIN Project(UVIC-Beta Technology Center)

According to the study carried out in previous years presented in the document Baseline Scenario Spain (WP3), it shows the way in which the locations of each composter were assigned. Each point has a variation in the number of composters: 6, 5, 4 and 3. Which vary in the number of contribution and maturation modules, being the contribution where citizens dispose of their organic matter in compostable bags that are subsequently opened and mixed with dry structuring; As for the maturation module, these are used in order to continue with the process of decomposition of organic matter, which is 12 weeks. For the treatment of pruning, the City Council of LMR has an old soccer field where pruning is arranged which is subsequently crushed and used as a structuring. In the following photographs you can see some composting points installed in different neighborhoods of LMR:

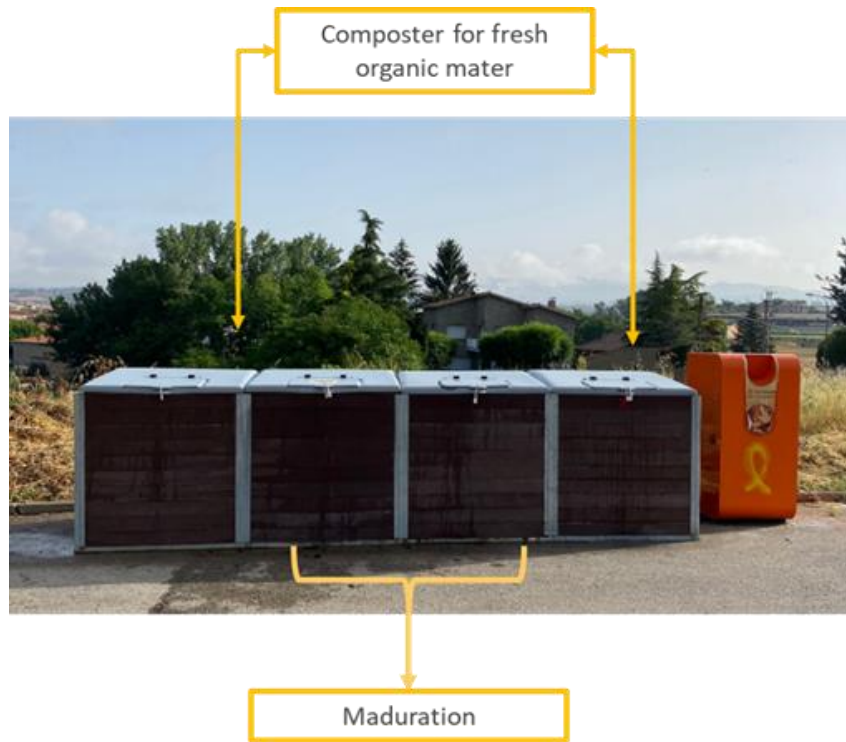


Figura 19. 4 Line composting located in neighborhood Vicentç, Casas del Vicentç spot  
Source: DECOST SPAIN Project(UVIC-Beta Technology Center)

\*Composting point of 4 lines: Two of contribution, two of maturation and a drawer of structuring.

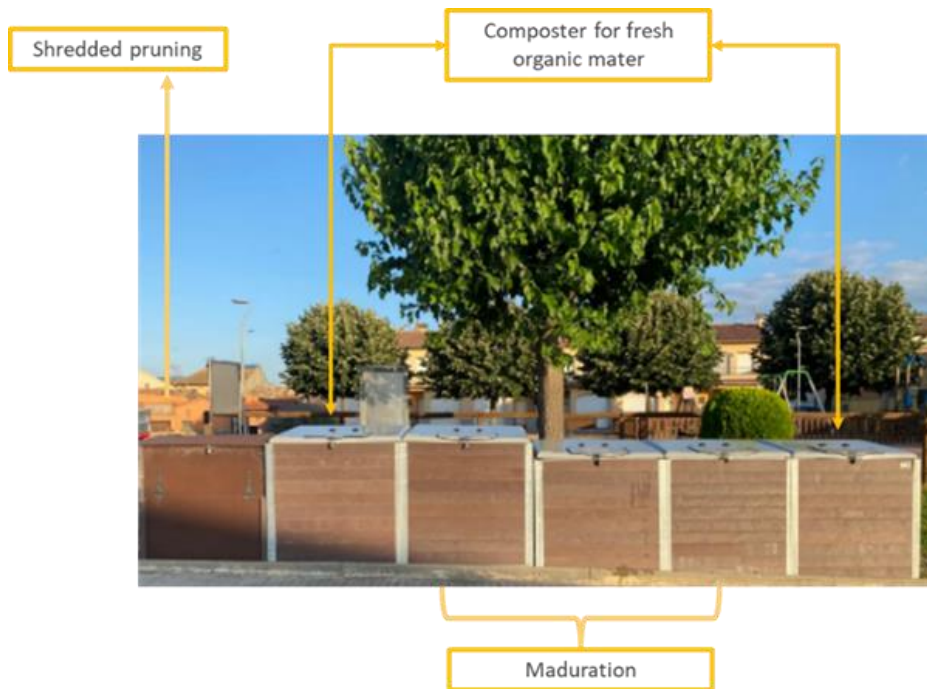


Figura 20. 5 Line composting located in neighborhood Fontanelles, Parque spot  
Source: DECOST SPAIN Project(UVIC-Beta Technology Center)

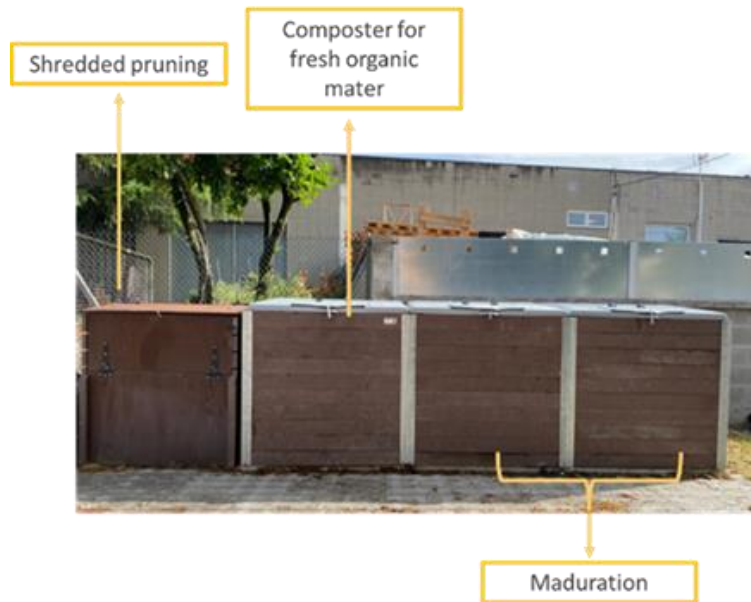


Figura 21. 3 Line composting located in neighborhood Casas nuevas, Industria spot  
Source: DECOST SPAIN Project(UVIC-Beta Technology Center)

#### Situation found vs current Les Masies de Roda -LMR-

The graphs below reflect one of the most positive results because of the change from curbside collection and treatment from centralized organic to door-to-door collection and organic treatment through decentralized community composting through the DECOST project. The most relevant results, in addition to the eradication of the problem of waste tourism (mentioned in the WP3 deliverables), can be noted in the improvements of separation at the source, noting how the fraction of mixed, decreased from 48% , generating as a consequence the increase in separation at the source of usable waste such as multi-product with an increase from 22% to 31%, glass increase from 25% and other waste from selective collection from 9% to 10%. As for the organic fraction, there is an increase from 18% to 28%, which means that by 2018 only 50% of the total OFMSW was source-selected and composted and currently, thanks to DECOST, 100% of the OFMSW is composted. These very successful results can be fully attributed to the waste management plan developed in DECOST which included the implementation of community composting as well as the change in the collection system of the other fractions from a street container system to a door-to-door collection system.

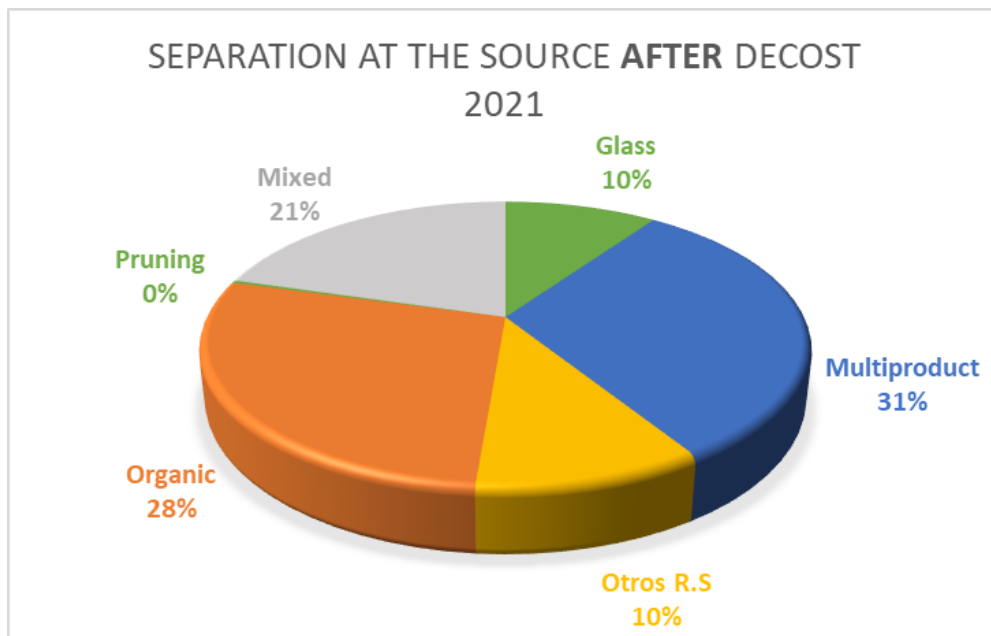
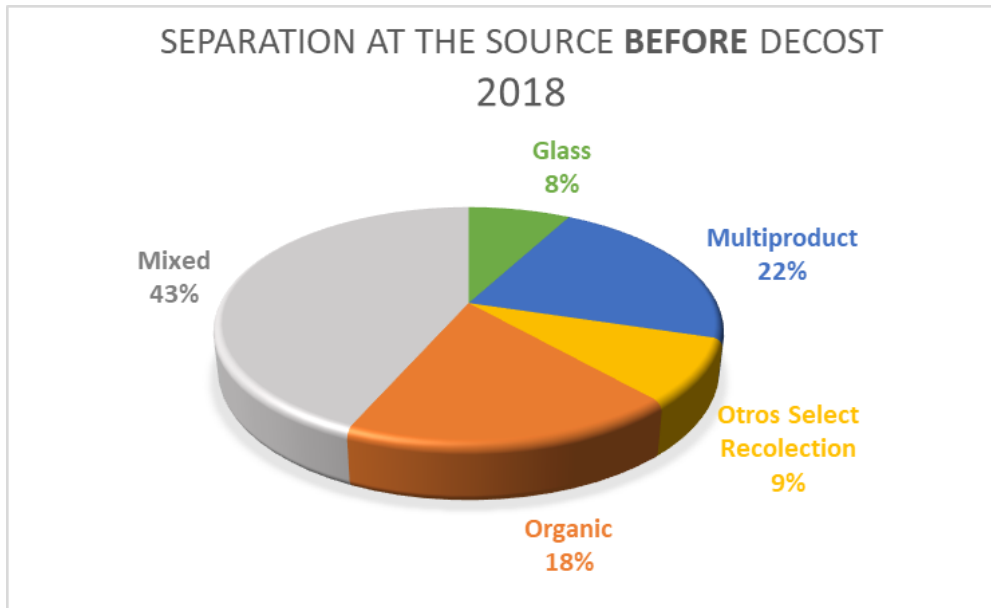


Figura 22. Percentage of organic matter before and after DECOST project.  
Source: DECOST Spain Project (UVIC-Beta Technology Center)(Waste Agency of Catalonia, 2021)

### 1.3.2 Vic waste recovery

For the treatment of organic matter in the Sant Llatzer neighborhood of the municipality of Vic, 24 composters were installed in 4 different points: Park, Black Tower, Caledetenes and road, the location and number of composters can be seen on the map below.



LOCATION	COMPOSTERS
Parque	6
Torre Negra	6
Hort	6
Parc	6
<b>Total</b>	<b>24</b>

Location of composters Barrio Sant Llatzer Vic. Source: DECOST SPAIN Project(UVIC-Beta Technology Center)

These composters work the same as those of LMR only that when they are 6, they are worked by lines of 3 being one of contribution and two of maturation. Additionally, unlike the LMR composting points, the Sant Llatzer composters have an additional area to arrange pruning. The following describes how each community composting point is composed.

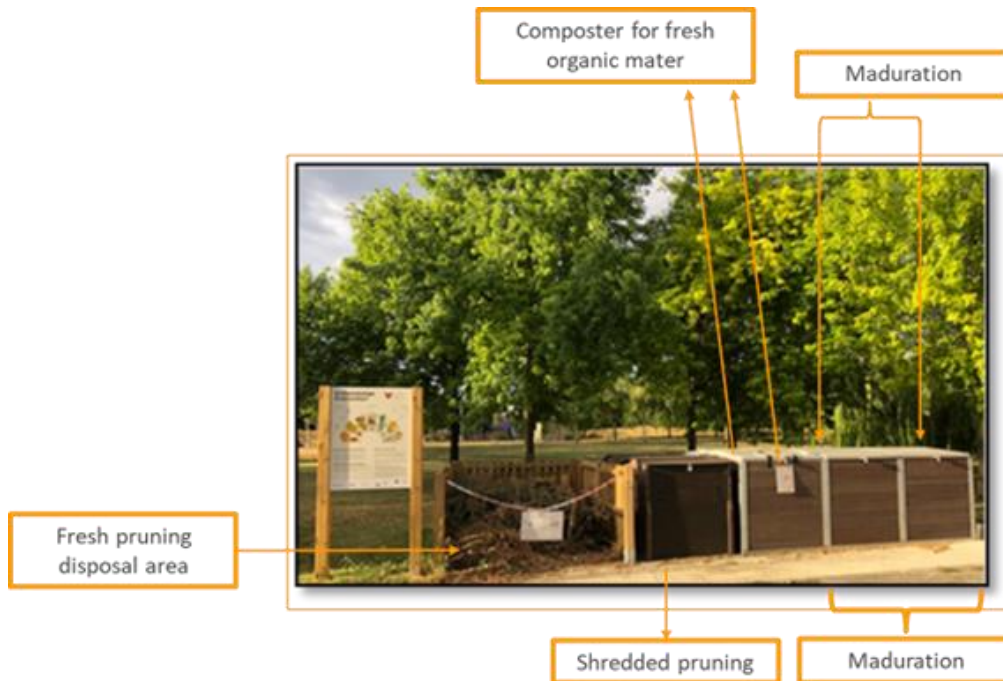


Figura 23. Composting point of 6 lines located in the Barrio Sant Llatzer – Calldetenes spot  
Source: DECOST Spain Project(UVIC-Beta Technology Center).

\*Composting point of 6 lines structuring box and a delimited area for the disposition of pruning: It works by lines of 3: One of contribution and two of maturation. When the contribution of a line is filled, it closes, and the next line is opened.

**Treatment capacity:**

Treatment capacity was calculated considering three parameters.

1. Waste generation
2. Sizing
3. Composting process

LOCATION	WASTE GENERATION	DIMENSIONING	PROCESS TIME	CALCULATE TREATMENT CAPACITY	TREATMENT CAPACITY
LMR	The total generation of waste in MRLs in 2021 was 323.31 Tn, that is, a per capita production of 1.3 kg/inha/day or 0.0013 Tn/inha/day of which 28% corresponds to the organic fraction. As for the generation of pruning, this was crushed and stored in 30 big-bags with a weight of 0.3 Tn each. This waste is then used as a structuring agent in the composting process. In Annex 1. Worksheet contains the information described.	Each line of 3 composters treats the organic matter generated by 75 families, taking into account the dynamics of transfers carried out in the field and the information contained in the technical sheet of the composters acquired. LMR has 63 composters the equivalent of 21 composting lines. Treatment capacity is 7 Tn/year/line	The composting process takes 90 days (3 months) to be carried out, that is, in the year this cycle is carried out 4 times	$Treatment\ capacity = Production\ per\ capita * 28\% * Each\ composting\ line\ serves * Number\ of\ lines\ installed * Duration\ of\ the\ composting\ process * Number\ of\ cycles\ during\ a\ year.$	For a subtotal of organic matter treatment capacity of 200 Tn/year, 9 Tn/year of pruning and a total of 209.04 Tn/year. As for the treated organic matter, this was 110 tons / year and 9 tons / year of pruning for a total of 119.18 tons / year of organic matter and pruning treated.
VIC-SANT LLATZER	The neighborhood Sant Llatzer has 1687 inhabitants, a per capita production of 1.28 kg/inha/day or 0.0012 Tn/inha/day. For a total generation of waste of 788.19 Tn/year in 2021, of which 28% corresponds to the organic fraction. As for the generation of pruning, it was crushed and stored in 36 big-bags with a weight of 0.3 tons each. This waste is then used as a structuring agent in the composting process. In Annex 1. Worksheet contains the information described.	Each line of 3 composters treats the organic matter generated by 75 families, taking into account the dynamics of transfers carried out in the field and the information found in the technical sheet of the composters acquired. Sant Llatzer has 24 composters the equivalent of 8 composting lines. Treatment capacity is 7 Tn/year/line			For a subtotal of organic matter treatment capacity of 76 Tn/year, 10.8 Tn/year of pruning and a total of 86.8 Tn/year. As for the treated organic matter, this was 56 tons / year and 10.8 tons / year of organic matter and pruning treated.

Tabla 5. Calculation of the treatment capacity and treated organic matter composter Spain.  
Source: DECOST SPAIN Project (UVIC-Beta Technology Center)

The following graph shows the treated organic matter considering the number of composters installed per neighborhood. It is observed that the Casas Noves neighborhood is the neighborhood that generates more organic matter and the left that generates the least, this contribution is also related to the number of composters installed, as well as the number of inhabitants served.

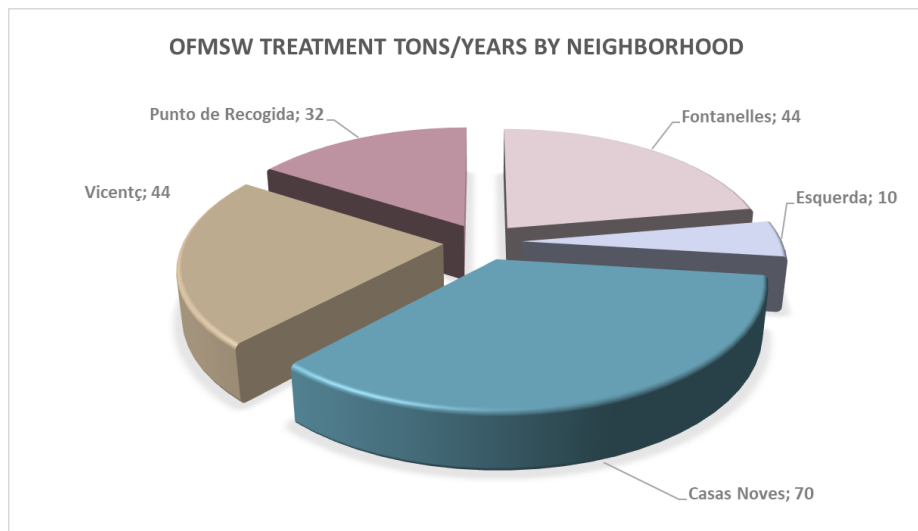


Figura 24. Organic matter treated according to number of composters installed per neighborhood Spain.  
Source: DECOST SPAIN Project (UVIC-Beta Technology Center)

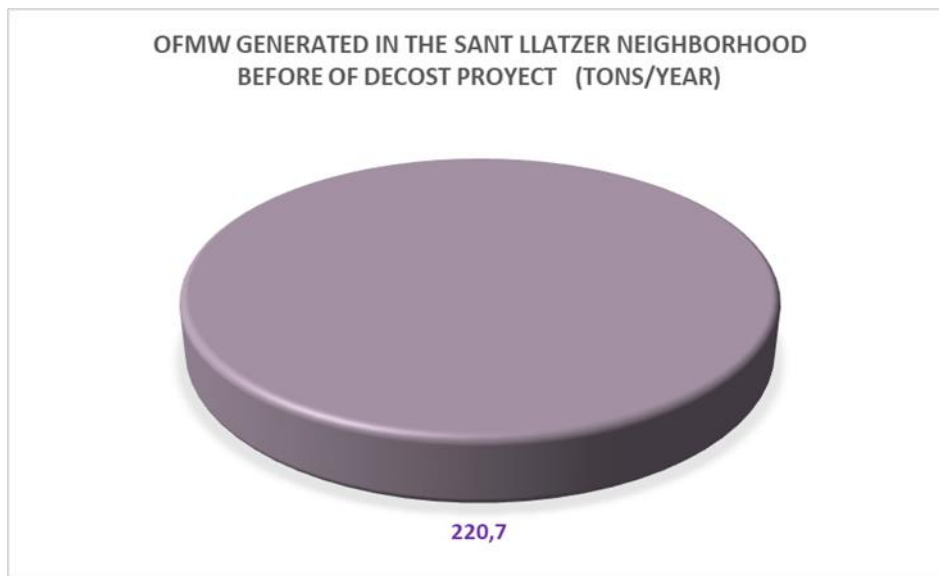
To ensure a quality compost in terms of its granulometry, achieve the recovery of the structuring to take advantage of it in the process again and technify the composting process in the screening phase, the DECOST Spain project has infrastructure and equipment (Annex 5: photographic record).

#### **Situation found Vs current situation Vic.**

The Municipality of Vic, established as an objective the reduction of 10% of waste generation in 2023 compared to 2010, being one of the key actions to promote home and community composting through the bonus of the waste rate of 20% according to the tax ordinances approved for all those people who have a composter or make use of community composters<sup>1</sup>. This action arises due to the efficiencies of organic matter collection, since by 2020 3,458.22 tons of organic matter were collected and this should represent 34% of the total waste collected in Vic and by 2020, they only account for 16.39%.<sup>2</sup>

In the Sant Llatzer neighborhood, in the municipality of Vic, the collection of all fractions including organic fractions continues to be carried out through the collection of containers on the sidewalk, transporting approximately 220 tons / year to the centralized composting plant Oris. However, in order to start a pilot in community composting, in 2021 24 composters were installed in 4 points of the neighborhood so that neighbors voluntarily contributed the organic matter generated. The result of this pilot allowed the treatment of 31 tons / year in organic matter in community compost and the remaining organic matter generated (189 tons / year) continued to be taken to Oris. These results show that decentralized community composting is a great alternative in the framework of organic matter management.

Currently, the maintenance of these composters oversaw the DECOST project until April 2023 and are currently in charge of the City Council of Vic.



<sup>1</sup> <https://tutries.vic.cat/compostatge-casola/>

<sup>2</sup> City Council of Vic. Report of results of waste collection of Vic.2020



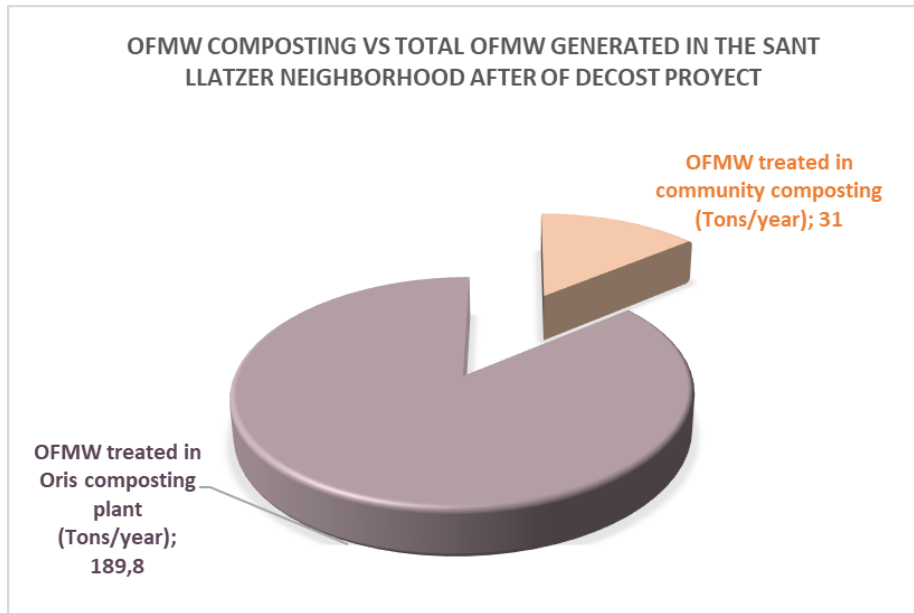


Figura 25. Amount of organic matter before and after the DECOST project  
Source: DECOST SPAIN Project (UVIC-Beta Technology Center)

As can be seen in the following graph, the amount of organic matter generated is calculated by multiplying the number of inhabitants of the Sant Llatzer neighborhood by the generation per capita. This result is multiplied by 28%, which is the approximate percentage of organic matter, thus obtaining a value of 215.5 Tn/year of organic matter generated in the Sant Llatzer neighborhood and a treatment of voluntary installed capacity of community composting of 56 Tn/year, which is equivalent to 1.53% of the total organic matter generated in the municipality of Vic and 28% of the organic matter generated in the Sant neighborhood. Llatzer.

#### 1.4. End users of compost produced in urban agriculture projects

As for the end users of compost production in urban agricultural projects, these are divided into two groups:

The first group is the population directly benefited through the management of organic matter and the subsequent obtaining of community composting and the second group is the population benefited by awareness and training activities on composting.

##### 1.4.1 Population directly benefited through the management of organic matter and the subsequent obtaining of community composting LMR

The inhabitants of MRLs distributed by neighborhood which correspond to 100% of the beneficiary population and by obtaining the compost which is freely accessible to all the inhabitants of LMR, for a total of 100% of the beneficiary population.

The use of compost is intended for agricultural projects developed by the inhabitants of the area on their farms and gardens. Agriculture is the most important economic activity of the municipality. In the rainfed lands are grown mainly cereals, fodder, potatoes, and legumes.

#### 1.4. 2 Population directly benefited through the management of organic matter and the subsequent obtaining of community composting Vic

Within the framework of the Sant Llatzer neighborhood, a participation of 25% (430 people) of 100% was evidenced. However, all the inhabitants of the Sant Llatzer neighborhood (1687) benefited from having at their disposal the community composters and compost as a result of this process. Regarding the total population of Vic (46,214) versus the inhabitants of the Sant Llatzer neighborhood (1,687) we are talking about a percentage of 3.6% of the beneficiary population.

#### 1.4.3 Poblacion benefited from awareness-raising and training activities on MRL composting.

The population benefited by awareness-raising and training activities on composting. In Annex 2 Photographic record and Activities carried out you can see the detail and number of attendees of each activity, which were in total 1755 participants.

#### 1.4.4 Poblacion benefited by awareness and training activities on composting VIC-SANT LLATZER.

The population benefited by awareness-raising and training activities on composting. In Annex 2 Photographic record and Activities carried out you can see the detail and number of attendees of each activity, which were in total 831 participants.

On the other hand, the DECOST project contributed 3.0% in the organic matter treated through self-composting, a category given by the Waste Agency to organic matter treated through community composting or home composting, whose figure for 2021 was 7,136.40 tons per year, as can be seen in the following graph.<sup>3</sup>

---

<sup>3</sup> Waste Agency of Catalonia. <http://estadistiques.arc.cat/ARC/> #

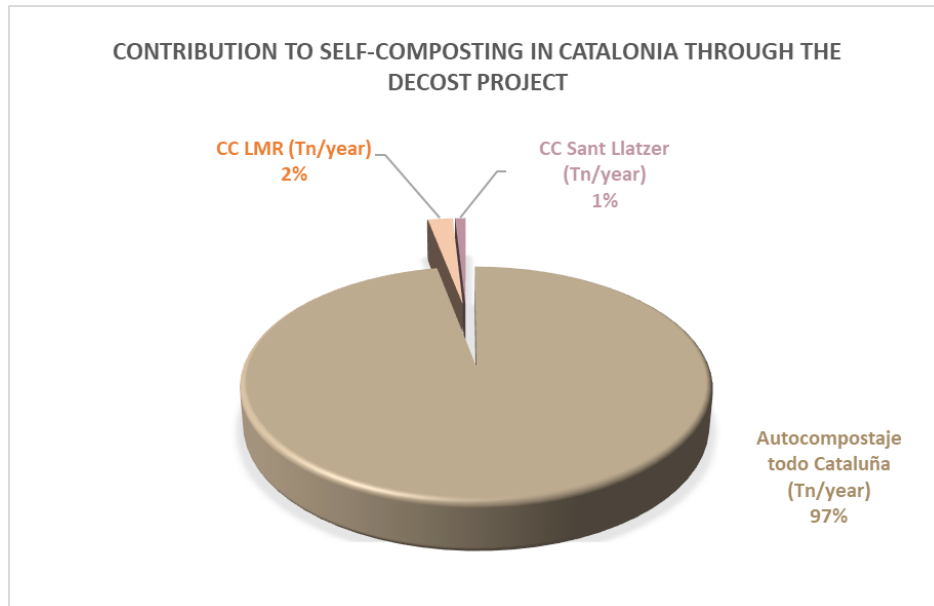


Figura 26. Contribution of community composting to self-composting figures in Catalonia: DECOST SPAIN Project (UVIC-Beta Technology Center)

### 1.5 OPERATION DATA: AVERAGE WEIGHT OF ORGANIC MATTER TREATED IN THE COMPOSTERS:

The following graph shows as an example the way in which the organic matter data is obtained, which consists of daily weighing of the incoming organic fraction in the composters.

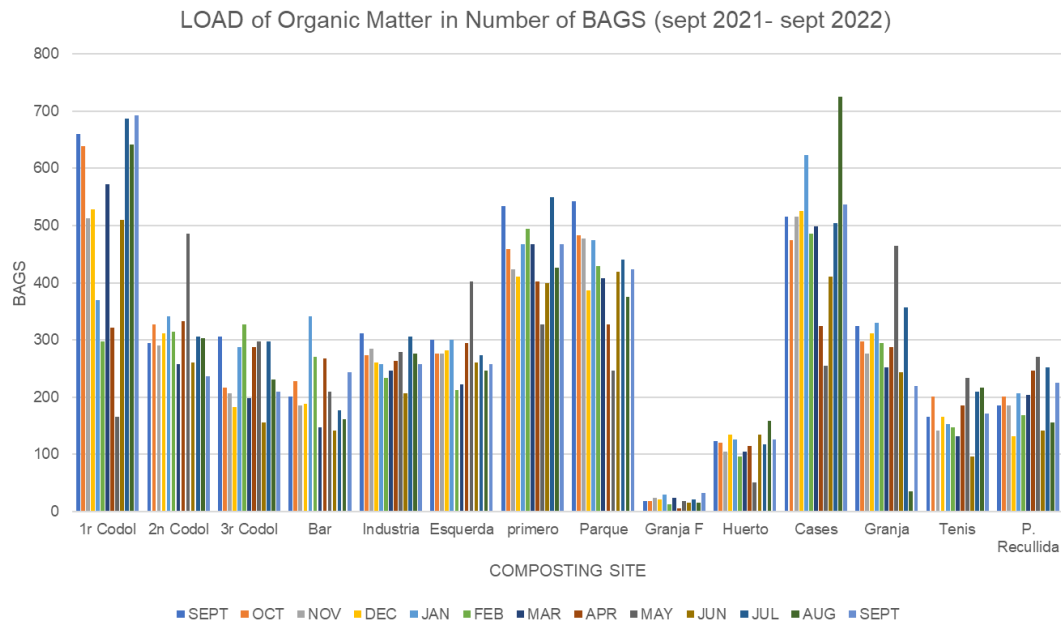


Figura 27. Information collection monthly weights of organic matter treated community composting LMR. Source: DECOST SPAIN Project (UVIC-Beta Technology Center)

Below are the physicochemical results of the compost obtained:

Descripció pel client		COMPOST 27/05/2021	
Propietats bàsiques		Resultats	
XK05V	XK Matèria seca a 105°C Matèria seca	Mètode : C5110015 Gravimetria	62.1 %
ANÁLISIS QUÍMICO		Resultats	
XK08I	XK Cadmi (Cd) (extracte àcid) Cadmi sms	Mètode : C5110228 Espectrometria ICP-OES	Detec. (<0.5) mg/Kg s.m.s.
XK08K	XK Coure (Cu) (extracte àcid) Coure (Cu)	Mètode : C5110228 Espectrometria ICP-OES	42.4 mg/Kg s.m.s.
XK08M	XK Crom (Cr) (extracte àcid) Crom sms	Mètode : C5110228 Espectrometria ICP-OES	Detec. (<10) mg/Kg s.m.s.
XK08P	XK Crom hexavalent (VI) (*) Crom (VI)	Mètode : Mètode Intern Espectrometria UV-VIS	<0.5 mg/Kg s.m.s.
XK08R	XK Mercuri (Hg) (extracte àcid) Mercuri (Hg)	Mètode : C5110228 Espectrometria ICP-OES	<0.4 mg/Kg s.m.s.
XK08T	XK Níquel (Ni) (extracte àcid) Níquel (Ni)	Mètode : C5110228 Espectrometria ICP-OES	6.0 mg/Kg s.m.s.
XK08V	XK Plom (Pb) (extracte àcid) Plom (Pb)	Mètode : C5110228 Espectrometria ICP-OES	10.2 mg/Kg s.m.s.
XK08X	XK Zinc (Zn) (extracte àcid) Zinc (Zn)	Mètode : C5110228 Espectrometria ICP-OES	146 mg/Kg s.m.s.
Anàlisis Microbiològic		Resultats	
UM5AT	NG Salmonella (D) (compost) (*) Salmonella	Mètode : AFNOR BRD 07/11-12/05 mod.	No detectado /25 g
UM9IK	NG Confirmation E Escherichia coli ISO 7251-M (*) Escherichia coli	Mètode : ISO 7251-M	43 MPN/g

Figura 28. physicochemical results of the compost obtained:Source: DECOST SPAIN Project (UVIC-Beta Technology Center)

The values are not greater than those established by the Decree in class A

Metal Pesado	Límites de concentración		
	mg/kg de materia seca		
	Clase A	Clase B	Clase C
Cadmio	0,7	2	3
Cobre	70	300	400
Níquel	25	90	100
Plomo	45	150	200
Zinc	200	500	1000
Mercurio	0,4	1,5	2,5
Cromo	70	250	300
Cromo (VI)	0	0	0

Figura 29. Final concentration limits of heavy metals Regarding the final quality of compost Royal Decree 506/2013

\*Salmonella: Absent in 25 g of processed product Escherichia coli: < 1000 most probable number (MPN) per gram of processed product



# ANNEX 2

## Statistical Report

### Pilots Italy

## ANNEX 2

# 2. Italy Pilot composter

### 2.1. Introduction

The implementation of the DECOST project in Italy was carried out in two different sites: The first in a peri-urban village in the city of Potenza (Basilicata Region) through decentralized community composting and the second in the city of Atella, which was developed as a centralized composting system.



Figura 30. Map of Italy- Its regions and cities of Potenza and Atella.  
Source: (The World Order, 2021)

#### 2.1.1 Potenza

Potenza (40°38'N 15°48'E) is an Italian municipality, the capital of the Basilicata region and the province of Potenza and is a comparatively more populous city in the region with a total of 64850 inhabitants. This population is distributed in an area of 175.43 km<sup>2</sup>, with a low population density for a capital city of 380.6 inhabitants / km<sup>2</sup>.

#### 2.1.2 Atella

The city of Atella is located in the Basilicata Region, province of Potenza with a total resident population of 3 681 inhabitants, a total area of 88.48 km<sup>2</sup> and a very low population density of 43.80 inhabitants / km<sup>2</sup>. The surrounding area, rich in green parks and water sources, is characterized by lush vegetation and cultivated land. The main activities in Atella are related to

agriculture, with a relevant production of wine and oil, but there are also different manufacturing activities and an important industrial area of 840,000 m<sup>2</sup>, which partially serves the large FCA car factory in Melfi.

## 2.2 Waste production

This numeral lists the most relevant information such as population, generation per capita, among others that allow to know the generation of waste in the municipalities in which the pilots were developed.

### 2.2.1 Waste production in Potenza

The Municipality of Potenza has a low population density (380.6 inhabitants per km<sup>2</sup>) with a total of 64,850 inhabitants in 2021 and 27,261 dwellings. The per capita generation corresponds to 0.40 kg/inhabitant/day, being 24% of organic matter. As for the population involved in the DECOST project, it corresponds to 270.

### 2.2.2 Waste production in Atella

The city of Atella has 3,681 inhabitants (2021) 27,261 homes. The per capita generation corresponds to 0.40 kg/inhabitant/day, being 24% of organic matter. As for the population involved in the DECOST project, it corresponds to 700.

## 2.3. Waste recovery

### ELECTROMECHANICAL MACHINE FOR COMMUNITY COMPOSTING

In Italy, a total of 3 electromechanical community composters were installed, distributed in two different locations: 1 community composter in the Municipality of Atella (Ecopans) with a capacity of 80 tons / year and two composters installed in the community of Potenza, whose capacity is 20 tons / year.

**Atella: ECOPANS - two chamber system:** The system has two different chambers, the first is the one where citizens introduce the waste, here there is a mixing tool and an aeration fan to continuously oxygenate the material. In the first chamber pellet is added as a structuring agent. After 30 days of maturation, the material passes into the second chamber (automatically), where it continues to move and ventilate for another 30 days. After this time, it is possible to take the material thanks to a side opening.

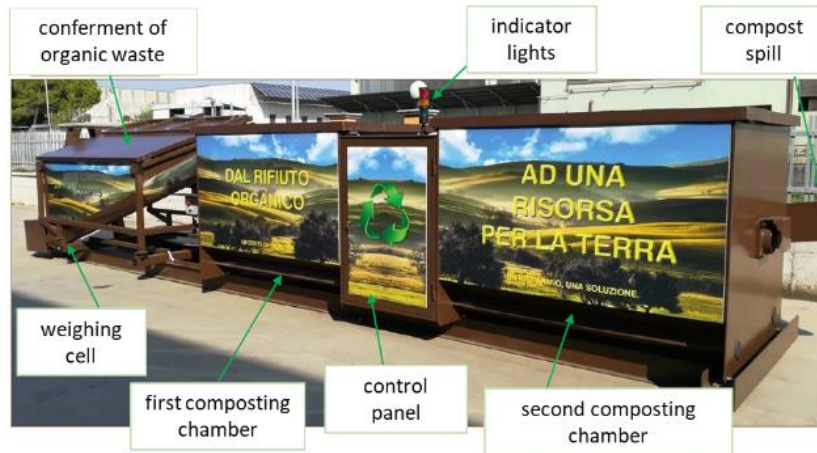


Figura 31. Composter Ecopans two chamber system Data  
Source Provider: DECOST Italia project(UVIC-Beta Technology Center)

**Potenza: CITY NET – rotating chamber system:** The management system after identifying the user checks the availability of daily charging and authorizes the opening of the door without the user having to touch anything on the structure. After the user has deposited the bag, the door is closed, the waste is weighed and transported in the composting chamber. From the weight entered, the system determines the amount of structure to be dosed in an automatic loader. The system needs the availability of a flat surface and the power supply of 380Volt - 50Hz. The system is a composting chamber with rotating cylinder without mechanical parts inside.



Figura 32. Composter City Net Rotating chamber system  
Data Source Provider: DECOST Italia project(UVIC-Beta Technology Center)

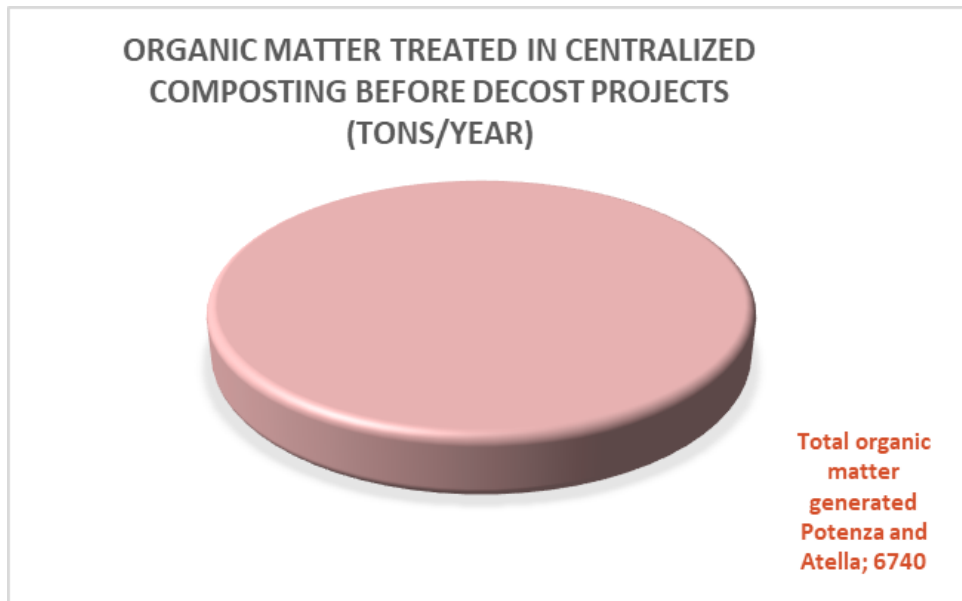


### Situation found Vs current Atella and Potenza

The implementation of the H&CC model contributed to improving the sustainability of waste management in terms of selective collection at source and recovery of municipal organic waste. It also contributed to the presence of various agricultural and livestock activities that can provide food and be used for composting.

Additionally, one of the great contributions in Potenza besides improving source separation, especially for the municipal area that includes several small, scattered villages where H&CC was considered a decentralized solution was the generation of Compost to be used in an existing urban project initiated by Legambiente (the largest Italian environmental NGO) in the suburbs of Potenza. Which was strengthened thanks to this decentralized community composting synergy provided by DECOST.

The generation of municipal waste between Potenza and Atella corresponds to 28197.84 tons/year, of which approximately 24% is organic material, i.e. 6740 tons/year. Thanks to the installed composters, the separation at source is being improved, treating 120 tons/year of organic matter.



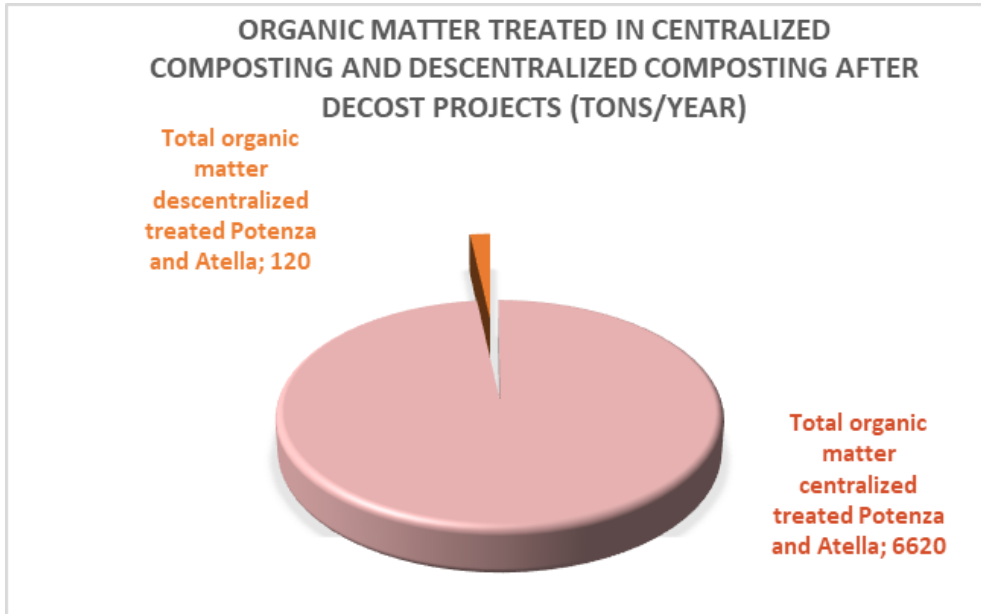


Figura 33. Amount of organic matter treated before and after Decost project: DECOST Italia project(UVIC-Beta Technology Center)

### 2.3.1 Potenza

In Potenza the community composter CITY NET – rotating chamber system was installed, which has Temperature sensors, humidity, an internal and external forced ventilation system, biofilter, control panel, Machine insulation system to make it waterproof and protect it from external meteoric phenomena, User recognition system: by identification card or health card, Automatic dosing system of the structuring material, Crushing system: upstream of the composter, Screening system: rotating sieve downstream of the composter, Air effluent parameter monitoring system: CO<sub>2</sub>, CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub>S, T<sup>o</sup>, U%. The process time is 90 days.



Figura 34. Community Composter City Net. Rotatin chamber system  
Data Source Provider: DECOST Italy Project(UVIC-Beta Technology Center)

### 2.3.2 Atella

In Potenza the community composter ECOPANS - two chamber system was installed, its structure is in steel, which has Temperature sensors, humidity, a ventilation system, biofilter, control panel, weighing cells, Maturation chamber, Automatic dosing system of the structuring material, Crushing system: upstream of the composter, Screening system: rotating water sieve below the composter, Air effluent parameters monitoring system: CO<sub>2</sub>, CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub>S, T<sup>o</sup>, U%.



Figura 35. Community Composter Ecopans two chamber system  
Data Source Provider: DECOST Italy Project(UVIC-Beta Technology Center)

#### **Treatment capacity:**

Treatment capacity was calculated considering three parameters.

1. Waste generation
2. Sizing
3. Composting process

LOCATION	WASTE GENERATION	DIMENSIONING	PROCESS TIME	CALCULATE TREATMENT CAPACITY	TREATMENT CAPACITY
Potenza	The total generation of waste in Potenza in 2021 was 26560.84 Tn, that is, a per capita production of 0.41 Tn/inha/day of which 24% corresponds to the organic fraction. The total population is 64850 inhabitants, of which 270 were benefited by the DECOST project. As for the generation of pruning is 9.65 Tn / year. This waste is then used as a structuring agent in the composting process. In Annex 1. Worksheet contains the information described.	The composter CITY NET – rotating chamber system, has a treatment capacity of 20 Tn / year and 2 were installed for a total of 40 Tn / year	The composting process takes 90 days (3 months) to be carried out, that is, in the year this cycle is carried out 4 times.	<i>Treatment capacity = Dimensioning</i>	For a subtotal of organic matter treatment and pruning capacity of 30, Tn/year and 10 Tn/year of pruning. As for the organic matter and pruning treated, this was 40 tons / year
Atella	The total generation of waste in Potenza in 2021 was 1631 Tn, that is, a per capita production of 0.44 Tn/inha/day of which 24% corresponds to the organic fraction. The total population is 3681 inhabitants, of which 700 were benefited by the DECOST project. As for the generation of pruning is 10 tons / year. This waste is then used as a structuring agent in the composting process. In Annex 1. Worksheet contains the information described.	The ECOPANS composter - two chamber system, has a treatment capacity of 80 Tn/year			For a subtotal of organic matter treatment and pruning capacity of 70 Tn/year, 10 Tn/year of pruning and a total of 74 Tn/year. As for the treated organic matter, this was 64 tons / year and 10 tons / year of pruning for a total of 74 tons / year of organic matter and pruning treated.

Tabla 6. Calculation of treatment capacity and treated organic matter composters Italy.

As can be seen in the following graph, the amount of total organic matter generated in Potenza and Atella, is calculated by multiplying the number of inhabitants (64850 and 3681 respectively) by the per capita generation (0.41 tn/inhabitant/day and 0.44 tn/inhabitant/ day). This result is multiplied by 24% which is the approximate percentage of organic matter, thus obtaining a value of 6740 Tn / year of organic matter generated in Potenza and Atella.

Considering that the population involved in the DECOST project is 1360 inhabitants, that is, 20% of the total population of these two places. Equivalent to a voluntary community composting treatment of 120 tons / year, which is equivalent to 1.78% of the total organic matter generated in Potenza and Atella.

#### 2.4. End users of compost produced in urban agriculture projects.

As for the end users of compost production in urban agricultural projects, these are divided into two groups:

The first group is the population directly benefited through the management of organic matter and the subsequent obtaining of community composting and the second group is the population benefited by awareness and training activities on composting.

##### 2.4.1 Population directly benefited through the management of organic matter and the subsequent obtaining of community composting Potenza.

In Potenza 270 people were involved in the DECOST project, additionally, it has a large municipal area that includes several scattered small villages where H&CC has been the best decentralized solution. Finally, the compost produced is used by an urban agriculture project that was preliminarily initiated by Legambiente (Italy's largest environmental NGO) in the suburbs of Potenza, as it has been improved and complemented very well with decentralized community.

composting provided by DECOST. The following map shows the location of these orchards. Where about 35 families benefit thanks to these urban gardens



Figura 36. Urban agriculture projects initiated by the NGO Legambiente in Potenza Site plan in Macchia Romana: DECOST Italy Project(UVIC-Beta Technology Center)

2.4. 2 Population directly benefited through the management of organic matter and the subsequent obtaining of Atella community composting.

In Atella 1090 people were involved in the DECOST project, in the management of organic matter, since in this city there is no separation at the source additionally, that is, 30% of the total population is contributing to an adequate management of organic matter thanks to its separation at the source and 100% of the population (3681) is benefiting from obtaining compost.

2.4.3 Population directly benefited through the management of organic matter and the subsequent obtaining of community composting Potenza.

In Potenza 270 people were involved in the DECOST project, in the management of organic matter, that is, 0.4% of the total population is contributing to an adequate management of organic matter thanks to its separation at the source and 100% of the population (64850) is benefiting from obtaining compost, as well as crop harvests from urban garden projects.

2.4.4 Population benefiting from awareness and training activities on Potenza composting.

The population benefited by awareness-raising and training activities on composting. In Annex 2 Photographic record and Activities carried out you can see the detail and number of attendees of each activity, which were in total 513 participants.

2.4. 5 Population benefited by awareness and training activities on Atella composting.

The population benefited by awareness-raising and training activities on composting. In Annex 2 Photographic record and Activities carried out you can see the detail and number of attendees of each activity, which were in total 763 participants.

## 2.5 OPERATION DATA: AVERAGE WEIGHT OF ORGANIC MATTER TREATED IN THE COMPOSTERS:

The following graph shows as an example the way in which the organic matter data is obtained, which consists of daily weighing of the incoming organic fraction in the composters.

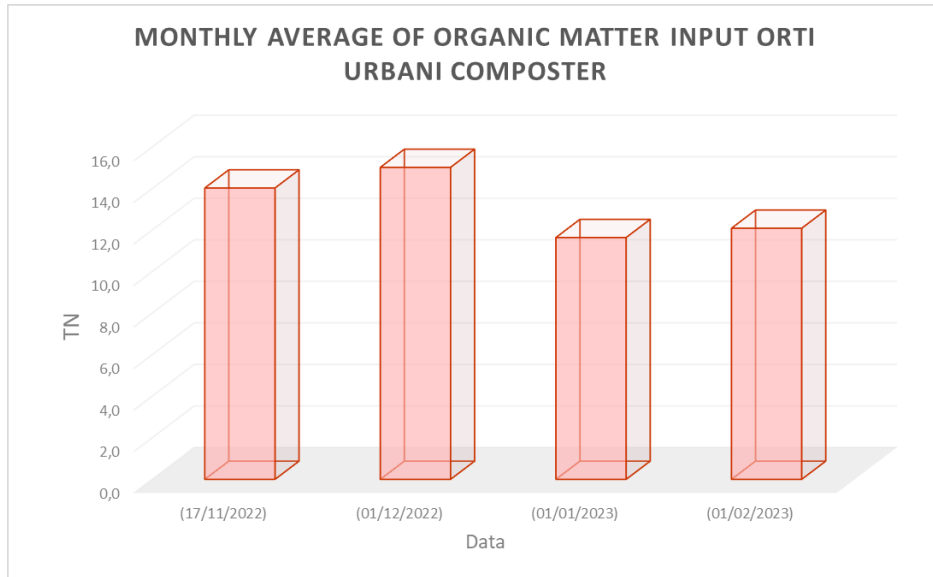


Figura 37. Information collection monthly weights of organic matter treated Orti Urban Compostes: DECOST Italy Project(UVIC-Beta Technology Center)

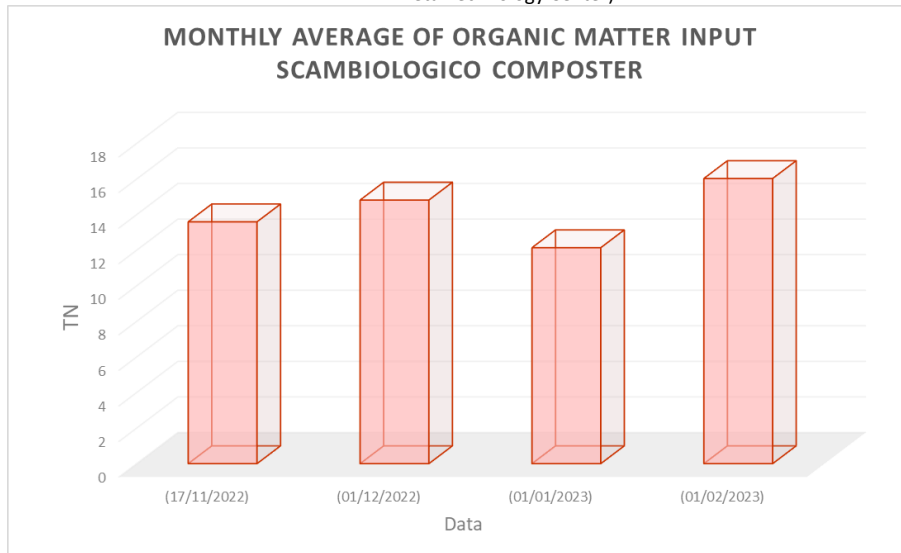


Figura 38. Information collection monthly weights of organic matter treated Scambiologico composter. Source Provider: DECOST ITALIA Project (UVIC-Beta Technology Center)



## ANNEX 3

# Statistical States Report Pilots Jordan

## ANNEX 3

### 3. Jordan composter

#### 3.1. Introduction

The implementation of the DECOST project in Jordan was carried out in Al Sarrow, a municipality located in northern Jordan within the district of Bani Kenana. The municipality consists of three municipal regions with a total population of 25400 people. The municipality of Al Sarrow in Jordan faces agricultural problems due to water scarcity in the country, Jordan's economy is one of the smallest in the region and suffers from a lack of natural resources. Farmers in Jordan face daily challenges such as a lack of irrigation facilities. Agriculture in Jordan has suffered a steady decline for decades. In addition, the lack of irrigation facilities is another challenge that farmers face daily.

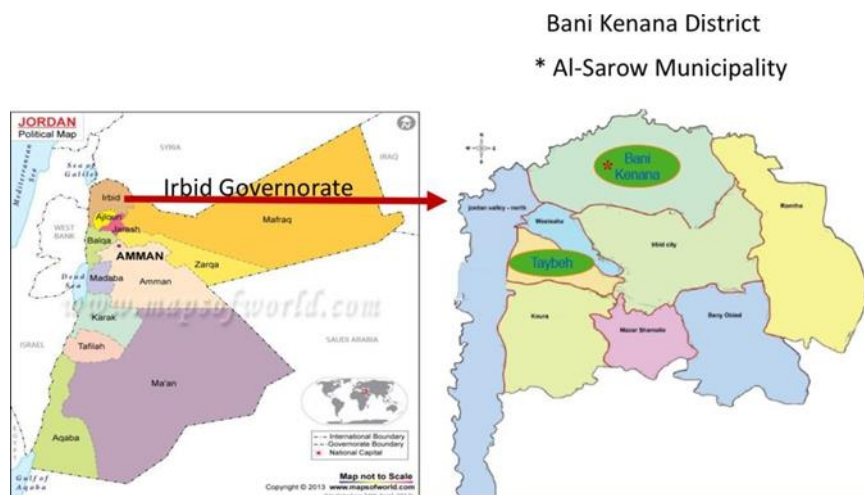


Figura 39. Map of Jordan its regions and cities of Al-Sarrow.  
Source Provider: DECOST Jordan Project (UVIC-Beta Technology Center)

#### 3.2 Waste production

The total amount of solid waste generated is approximately 9271 Tn/year the organic fraction 60% of the total solid waste generated. As for the population involved in the DECOST project, it corresponds to 676 inhabitants.

#### 3.3. Waste recovery

In Al-Sarrow 100 homemade composters were installed, in addition to providing together with these 100 composters, shredders and temperature meters. The composters have a capacity of 0.4 Tn/composting cycle. Each cycle corresponds to 90 days.





Figura 40. Home Composter installed in Jordan.  
Source Provider: DECOST Jordan Project (UVIC-Beta Technology Center)

Domestic and community composting sites were established. At these sites, 100 composting containers, 100 temperature meters, 100 moisture meters, 100 shredders, 100 mixers and pH meters were distributed in Al-Sarow municipality. For a total treatment capacity of 175 Tn/year.



Figura 41. Home Composter delivered in Jordan.  
Source Provider: DECOST Jordan Project (UVIC-Beta Technology Center)

### **Situation found vs current Jordan.**

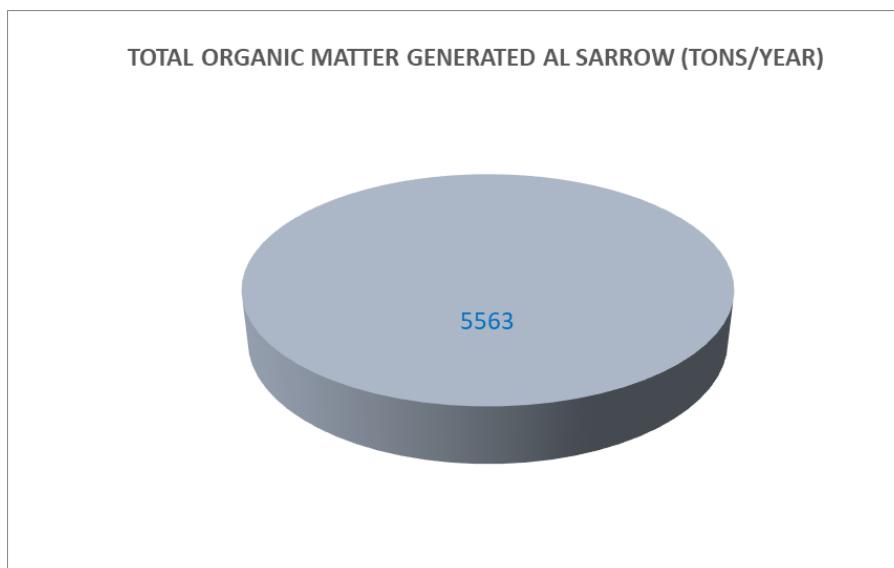
Prior to the Decost project, the total collection and transport of waste was managed by the municipality, where citizens collected their waste unseparated, using 1m3 containers and transported to the landfill of AL-Akaider, which is located 50 km from the municipality of Al-Sarow area by the municipality.

Waste management is one of the most difficult problems faced in Jordan, in addition to the scarcity of water needed to irrigate existing orchards. In this context, the implementation of the

H&CC model contributed to improving the sustainability of waste management, especially the organic fraction, generating a difference in the collection of organic fraction waste at source and its recovery by 3%, while drastically reducing municipal solid waste disposed of to landfill. DECOST contributed to local waste management policies regarding separate collection at source and recovery of municipal organic waste. In addition, to contribute to the presence of various agricultural activities that can provide food, water collection, and exploit for composting.

As can be seen in the following graph, the amount of total organic matter generated in Al Sarrow is calculated by multiplying the number of inhabitants (25400) by the per capita generation (0.001 tons / inhabitant / day) by 365 days. This result is multiplied by 60% which is the approximate percentage of organic matter, thus obtaining a value of 5563 Tn / year of organic matter generated in the three sessions of Al Sarrow.

Considering that the population involved in the DECOST project is 676 inhabitants, that is, 3% of the total population. Equivalent to a home composting treatment of 148 Tn/year.



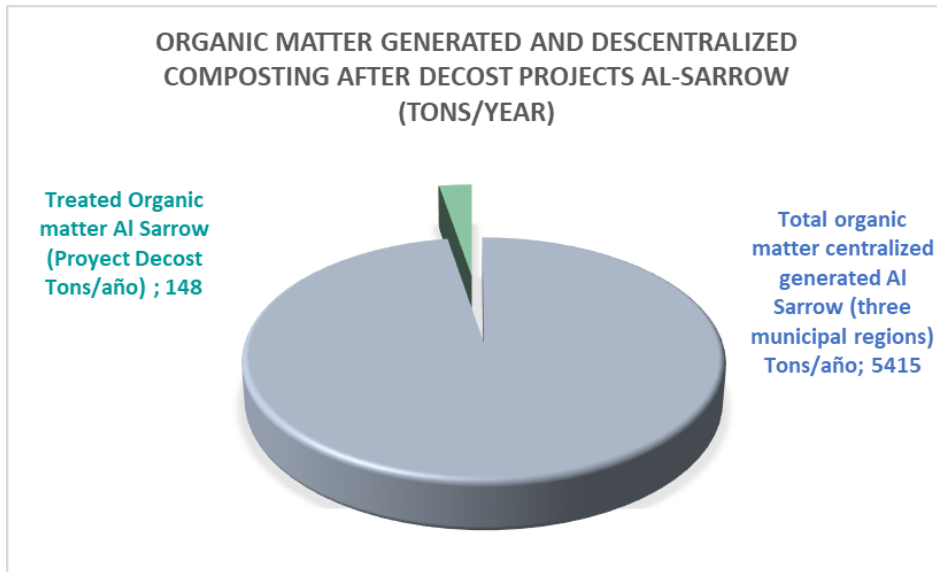


Figura 42. Amount of organic matter treated before and after the DECOST project.  
Source: DECOST Jordan Project (UVIC-Beta Technology Center)

Treatment capacity was calculated considering three parameters.

1. Waste generation
2. Sizing
3. Composting process

LOCATION	WASTE GENERATION	DIMENSIONING	PROCESS TIME	CALCULATE TREATMENT CAPACITY	TREATMENT CAPACITY
Al Sarrow	The total generation of waste in Al Sarrow in the three municipal regions in 2021 was 9271 Tn, that is, a per capita production of 0.001 Tn/Inha/day of which 60% corresponds to the organic fraction, that is, 5563 Tn/year. The population involved in the DECOST project was 676 inhabitants with a generation of organic waste of 148 Tn/year. As for the generation of pruning is 15 tons / year. This waste is then used as a structuring agent in the composting process. In Annex 1. Worksheet contains the information described.	Cada compostador cuenta con una capacidad de tratamiento de 0,4 Tn/ciclo, es decir 1,6 Tn/año por compostador, ya que en total son 100, el tratamiento total de orgánica y poda es de 160Tn/año	The composting process takes 90 days (3 months) to be carried out, that is, in the year this cycle is carried out 4 times.	$Treatment\ capacity = Dimensionamiento * Each\ composting * Duration\ of\ the\ composting\ process * Number\ of\ cycles\ during\ a\ year.$	For a subtotal of organic matter treatment and pruning capacity of 160, Tn/year and 15 Tn/year of pruning, total of 175 Tn/year. As for the organic matter and pruning treated, it was 148 Tn / year organic and 15 Tn pruning, for a total of 163 Tn / year

Tabla 7. Calculation of the treatment capacity and treated organic matter composters Jordan.  
Source: DECOST Jordan Project (UVIC-Beta Technology Center)

### 3.4. End users of compost produced in urban agriculture projects

As for the end users of compost production in urban agricultural projects, these are divided into two groups:

The first group is the population directly benefited through the management of organic matter and the subsequent obtaining of community composting and the second group is the population benefited by awareness and training activities on composting.

### 3.4.1 Population directly benefited through the management of organic matter and the subsequent obtaining of community composting Al Sarrow

In Anabta 676 people were involved in the DECOST project, the benefits obtained from home composting can be classified into two sectors: Sensibilization, environmental benefits by managing organic matter and fixing nutrients in the soil, community benefits against food security and economic benefits in the development of the local economy.

Awareness-raising: Introduction to the concept of separation of food scraps, education to children and the general public about composting, how it works and how it can be integrated into their daily lives, encouraging the next generation to large-scale composting as part of their way of life

Environmental benefits: Jordan is the second poorest country in water resources, with high costs to supply water to people and businesses. In addition, the Jordanian water sector is struggling to meet growing demand stemming from rapid population and economic growth, as well as refugee flows from different countries (Iraq, Syria, Palestine, Libya and Yemen). Water treatment and reuse in Jordan is carried out through a centralized system, in which treated water is transferred to large agricultural areas and is not available for agricultural use at the domestic level due to the potential adverse effect on human health. Therefore, for the Urban Agriculture component of the DECOST project in Jordan, where municipalities supply water to houses for a few hours once a week, it is crucial to secure water sources for irrigation purposes. Therefore, within the framework of this project, the supply of tanks and hoses was carried out so that the collection of water from the areas of the houses is part of the model (Figure) since, the annual rainfall is about 400 mm, so, assuming that the surface of the house is 250 m<sup>2</sup>, the amount of water collected in the area of the house will be about 100 m<sup>3</sup>, enough water for the component of Urban Agriculture of DECOST.

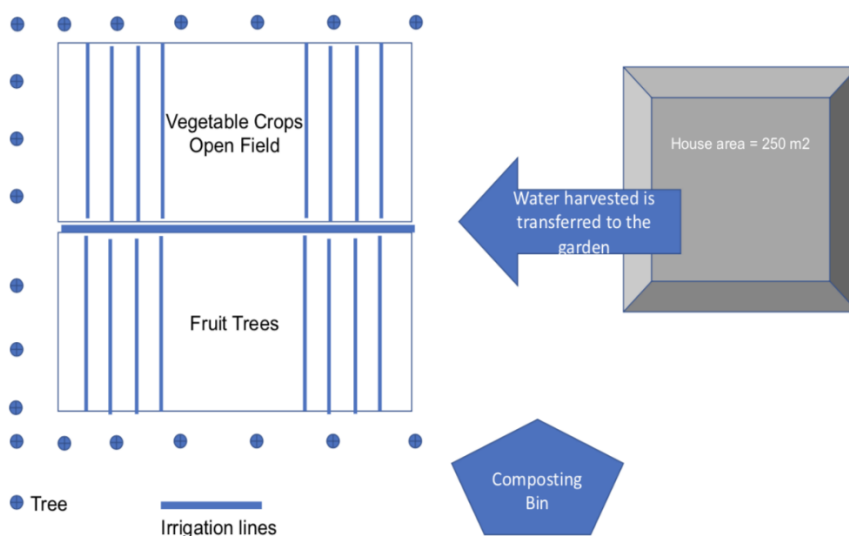


Figura 43. Design of the Urban Agriculture model applied in Jordan within the framework of the DECOST project including water harvesting and two types of horticultural activities.

Source: DECOST Jordan Project (UVIC-Beta Technology Center)



Figura 44. Citizen operating the irrigation system for the UA



Figura 45. Mayor of Al Sarow Municipality talking to one citizen practicing home composting



Figura 46. Installing irrigation system for UA

Benefits of the local economy – The agricultural sector in Jordan has a moderate contribution to GDP (about 3%), however, it is considered essential for integrated rural development, a source of income and employment for the rural population. Therefore, the development of an urban agriculture component of DECOST generated a significant impact on Jordan's rural development. It is important to highlight how these types of projects help to improve the environmental, economic, and social situation in poor areas where natural resources and food may be scarce.

3.4.2 Population benefiting from awareness and training activities on Al Sarrow composting.

The population benefited by awareness-raising and training activities on composting. In Annex 2 Photographic record and Activities carried out you can see the detail and number of attendees of each activity, which were in total 138 participants.

Among the activities carried out are training in the proper separation at the source, composting process and maintenance, application and use of compost in home gardens of citizens

### 3.5 OPERATION DATA: AVERAGE WEIGHT OF ORGANIC MATTER TREATED IN THE COMPOSTERS:

The following graph shows as an example the way in which the organic matter data is obtained, which consists of daily weighing of the incoming organic fraction in the composters.

please include information related to organic matter weighed on a monthly basis to obtain graphs similar to those shown below

A greenhouse experiment was conducted to evaluate the benefits of compost produced on plant growth and soil quality: Showing the positive effect of compost on plant growth and organic matter of both sandy and clay soils



Figura 47. Greenhouse experiment

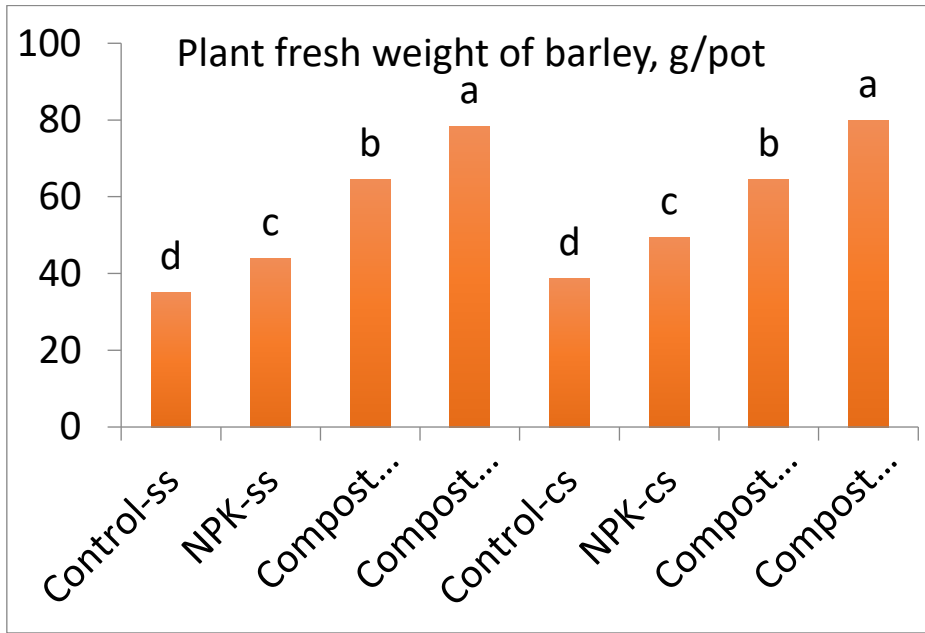
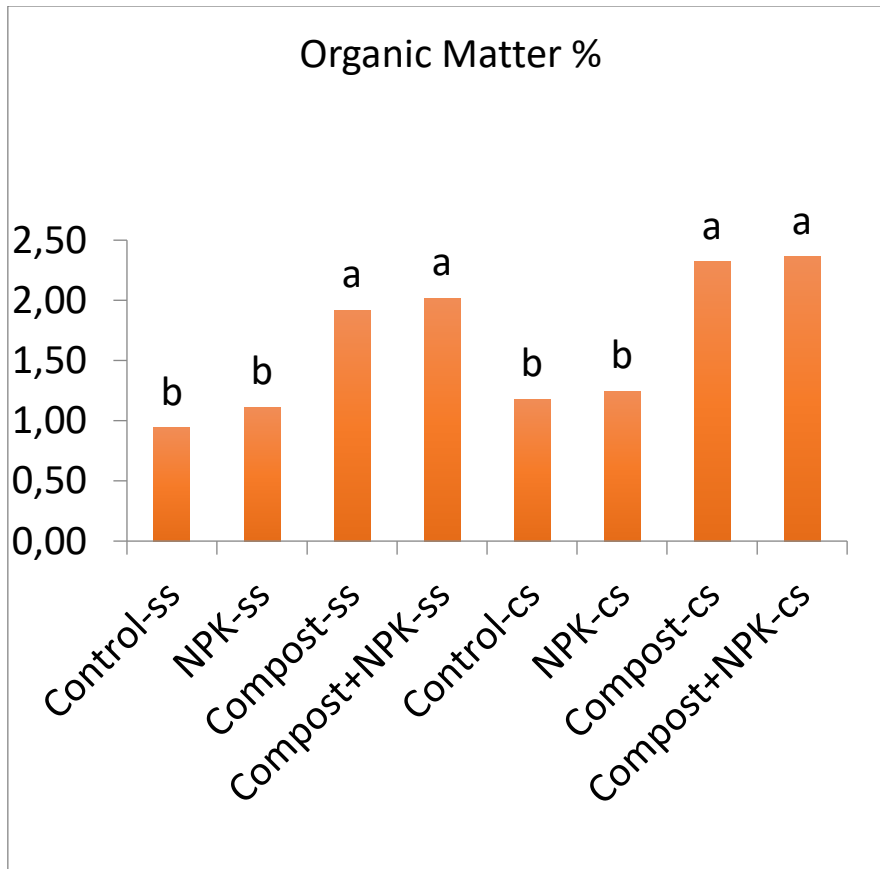


Figura 48. Positive effect of compost on plant growth



\*SS= Sandy soil; Cs=Clay soil; NPK= nitrogen + phosphorous + Potassium;  
Figura 49. Positive effect of compost on organic matter





# ANNEX 4

## Statistical Report Pilots Palestine

## ANNEX 4

# 4. Palestine compost

### 4.1 Introduction

The implementation of the DECOST project in Palestine was carried out in two phases: The first phase was in Kufur Rumman (suburb of Anabata) where home composting approach was used, and the second phase was in Anabata, in Tulkarm, in northern Palestine through decentralized home and community composting systems

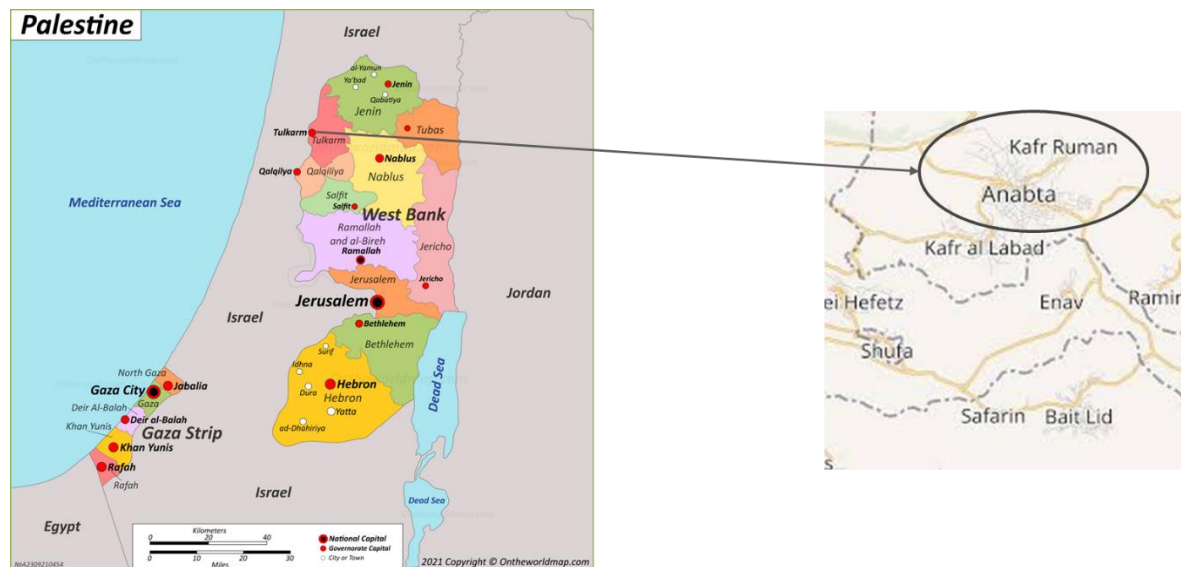


Figura 50. Map of Palestine – Its Regions and cities of Anabta and Kafr Ruman Source: (Ontheworldmap, 2023)

#### 4.1.1 Anabta

A Palestinian city located in the northern West Bank, the city has a population of 10,000 people (including 1,000 inhabitants of Kurf Rumman), with an area of 1544.8 hectares under the municipal council and is one of the oldest municipalities in the Tulkarem governorate. The city has an urban area of approximately 1300 km<sup>2</sup>. Most of its surface is occupied by olives, figs, almonds or is covered with forests. It is located 19 kilometers west of Nablus and 9 kilometers east of Tulkarm.

#### 4.1.2 Kurf Rumman

Kurf Rumman has an area of 390 hectares and is in one of the limits of the city of Anabta, being the only suburb of Anabta with a population of 1,000 inhabitants.

## 4.2 Waste production

This numeral lists the most relevant information such as population, generation per capita, among others that allow to know the generation of waste in the municipalities in which the pilots were developed.

### 4.2.1 Waste production at Anabta

The city of Anabta has a total of 10,000 inhabitants in 2021 (including 1,000 inhabitants of Kurf Rumman) and 2,000 dwellings. The generation per capita between 0.85 and 1.2 kg / inhabitant / day, between 55% and 70% of organic matter. As for the population involved in the DECOST project, it corresponds to 1848.

### 4.2.2 Waste production at Kurf Rumman

Community of Kurf Rumman has 1,000 inhabitants (2021). between 0.85 and 1.2 kg/inhabitant/day, between 55% and 70% organic matter. As for the population involved in the DECOST project, it corresponds to 100%. For a total of 2,848 people involved

## 4.3. Waste recovery

In Palestine, a total of 400 home composters were installed, which were distributed in each household in Kurf Rumman and in the center of Anabta, whose citizens had a back garden or nearby. Additionally, a community composter was installed in the center of Anabta. The total treatment capacity of the Palestine pilot was around 575 Tn/year.

### **Home composting in Kurf Rumman and remote areas of Anabta, (about 400 composters, size = 340 L each = 0,34 Tn)**

This cylindrical metal composter allows the obtention of compost by mixing the fresh OFMSW and bulking agent (e.g., wood chips, saw dust, etc.) through a lateral opening, which can be closed and by means of a manual lever can be rotated 360 degrees.



Figura 51. Cylinder home composters 360°  
Source: DECOST Palestine Project (UVIC-Beta Technology Center)

**Community composting cylindric is applied in the center of Anabta town (one composter, size = 7m<sup>3</sup>):** Its operation is like the home composters mentioned above, additionally, this community composter has an electric conveyor belt that facilitates the feeding of the OFMSW to the composter.



Figura 52. Cylinder Community composters 360°  
 Source: DECOST Palestine Project (UVIC-Beta Technology Center)

### **Situation found vs current Anabta.**

Before the Decost project, the collection and transport of all waste was managed by the "Municipality of Anabta", where citizens collect their waste unseparated, mainly in nylon bags. The waste is then deposited in fixed metal or plastic containers supplied by the municipality and located a short distance from the houses (between 100 and 150 meters), and a municipal vehicle collects the waste from the containers and transports it to the transfer station.

Waste management is one of the most difficult problems faced in Palestine, due to the generation of large amounts of waste, with insufficient facilities to recycle or dump waste. The main generators of SW are homes, factories, cultivated areas, schools and shops. In this context, the implementation of the H&CC model contributed to improving the sustainability of waste management, increasing the collection of waste at source, especially organic matter, and its recovery by (572 Tn/year) 28%, while drastically reducing municipal solid waste disposed to landfill. DECOST contributed to local waste management policies in terms of separate collection at source and recovery of municipal organic waste. In addition, to contribute to the presence of various agricultural activities that can provide food and exploit for composting.

As can be seen in the following graph, the amount of total organic matter generated in Anabta and Kurf Rumman is calculated by multiplying the number of inhabitants (10,000) by the per capita generation (0.001 tn/inhabitant/day). This result is multiplied by 55% which is the

approximate percentage of organic matter, thus obtaining a value of 2008 Tn/year of organic matter generated in Anabta and Kurf Rumman.

Considering that the population involved in the DECOST project is 1191 inhabitants, that is, 55% of the total population of these two places. Equivalent to a treatment or community and home composting of 365 tons / year.

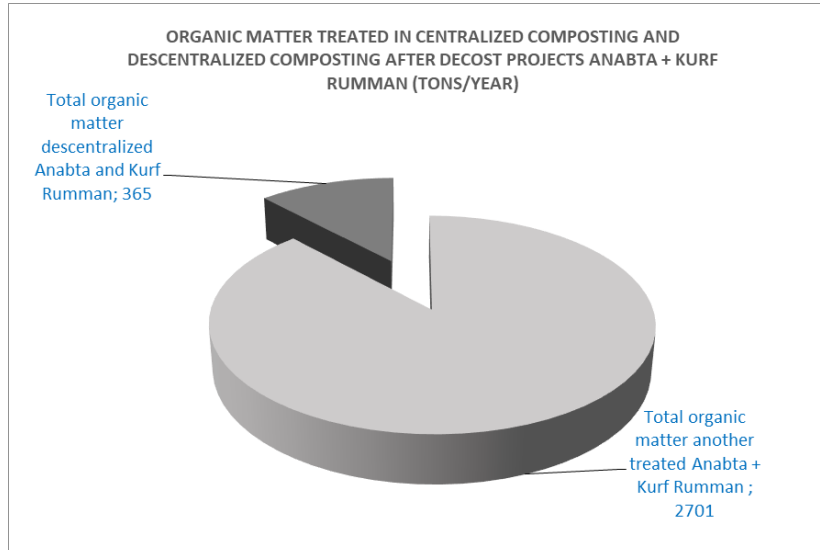
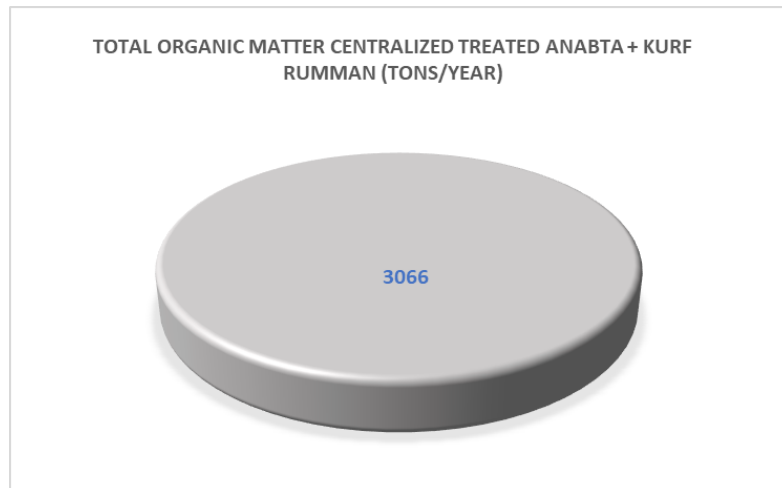


Figura 53. Amount of organic matter treated before and after the Decost project  
Source: DECOST Palestine Project (UVIC-Beta Technology Center)

#### 4.3.1 Anabta

In Anabta, the community composter was installed in the city center, with a capacity of 7 m<sup>3</sup> per composting cycle. Each cycle corresponds to 90 days.



Figura 54. Cylinder Community composters 360°  
Source: DECOST Palestine Project (UVIC-Beta Technology Center)

#### 4.3.2 Kurf Rumman

In Kurf Rumman, 400 home composters of 0.34 Tn/cycle were installed, each cycle being equivalent to 90 days. Before installing these composters, a survey was carried out in order to know if the proposed collaborators had a garden in the backyard, or any other alternative place, and if they were willing to contribute to home composting.



Figura 55. Home composting 360°  
Source: DECOST Palestine Project (UVIC-Beta Technology Center)

## Treatment capacity:

Treatment capacity was calculated considering three parameters.

1. Waste generation
2. Sizing
3. Composting process

LOCATION	WASTE GENERATION	DIMENSIONING	PROCESS TIME	CALCULATE TREATMENT CAPACITY	TREATMENT CAPACITY
Anabta	The total generation of waste in Anabta in 2021 was 3650 Tn, that is, a per capita production of 0.001 Tn/inha/day of which 55% corresponds to the organic fraction, that is, 2008 Tn/year. The total population is 10000 (including 1000 inhabitants of Kurf Kumman), of which 2848 were directly benefited by the DECOST project. As for the generation of pruning is 10 tons / year. This waste is then used as a structuring agent in the composting process. In Annex 1. Worksheet contains the information described.	The community composter – has a treatment capacity of 0.7 Tn/cycle, i.e. 28Tn/year	The composting process takes 90 days (3 months) to be carried out, that is, in the year this cycle is carried out 4 times.	$Treatment\ capacity = Dimensionamento * Each\ composting * Duration\ of\ the\ composting\ process * Number\ of\ cycles\ during\ a\ year.$	For a subtotal of organic matter treatment and pruning capacity of 18, Tn/year and 10 Tn/year of pruning. As for organic matter and pruning, in this case it is equal to the treatment capacity, for a total of 28 Tn / year
Kurf Kumman	The total generation of waste in Kurf Kumman in 2021 was 365 Tn, that is, a per capita production of 0.001 Tn/inha/day of which 55% corresponds to the organic fraction, that is, 201 Tn/year. The total population is 1000 inhabitants, of which 100% were benefited by the DECOST project. As for the generation of pruning is 54 tons / year. This waste is then used as a structuring agent in the composting process. In Annex 1. Worksheet contains the information described.	The home composters, have a treatment capacity of 0.34 Tn / cycle (each), i.e. 1.36 Tn / year for each, since in total there are 400, the total treatment of organic and pruning is 544Tn / year			For a subtotal of organic matter treatment and pruning capacity of 490, Tn/year and 54 Tn/year of pruning. As for the organic matter and pruning treated, in this case it is equal to the treatment capacity, for a total of 544 Tn / year

Tabla 8. Calculation of treatment capacity and treated organic matter composters Palestine.  
Source: DECOST Palestine Project (UVIC-Beta Technology Center)

### 4.4. End users of compost produced in urban agriculture projects.

As for the end users of compost production in urban agricultural projects, these are divided into two groups:

The first group is the population directly benefited through the management of organic matter and the subsequent obtaining of community composting and the second group is the population benefited by awareness and training activities on composting.

#### 4.4.1 Population directly benefited through the management of organic matter and the subsequent obtaining of community composting Anabta

In Anabta, 1848 people were involved in the DECOST project, the benefits obtained from community composting can be classified into four sectors: awareness-raising, environmental benefits, community benefits and benefits of the local economy.

Awareness-raising: Introduction to the concept of separation of food scraps, education to children and the public about composting, how it works and how it can be integrated into their daily lives, encouraging the next generation to large-scale composting as part of their way of life.

Environmental benefits: Production of fertile soil full of nutrients and improved soil fertility, improved surface composition, reduced stormwater runoff and soil erosion, replacement of energy-intensive fertilizers, pesticides and fungicides, reduction in plant growth and, consequently, carbon sequestration, reduction in waste generation, climate protection by reducing methane emissions from landfills and creating a carbon sink in soils.

Community benefits: Enabled local operation at the neighborhood level, built the culture and knowledge of community composting, promotion of technology on a human scale, rather than large capital-intensive systems, promotion of balanced processing of locally grown food and "closed loop" systems.

Benefits of the local economy – Promotion and diversification of urban markets through the promotion of small industrial enterprises

4.4.2 Population directly benefited through the management of organic matter and the subsequent obtaining of community composting Kurf Rumman

In Kurf Rumman, 10 00 people were involved in the DECOST project, i.e. all the inhabitants in the management of organic matter, since in this city there is no separation at the source additionally, i.e. 100% of the total population is contributing to an adequate management of organic matter thanks to its separation at the source and 100% of the population (1 000) is benefiting from obtaining compost.

4.4.3 Population benefiting from awareness and training activities on composting Anabta and Kurf Kumman.

The population benefited by awareness-raising and training activities on composting. In Annex 2 Photographic record and Activities carried out you can see the detail and number of attendees of each activity, which were in total 2600 participants.

Among the activities carried out are training in the proper separation at the source, composting process and maintenance, application and use of compost in home gardens of citizens

Finally, an additional benefit obtained was the request to the Ministry of Local Administration to modify the tax on waste disposal according to the weight of the waste produced.

#### 4.5 OPERATION DATA: AVERAGE WEIGHT OF ORGANIC MATTER TREATED IN THE COMPOSTERS:

The following graph shows as an example the way in which the organic matter data is obtained, which consists of daily weighing of the incoming organic fraction in the composters.

please include information related to organic matter weighed on a monthly basis to obtain graphs similar to those shown below





Figura 56. Characterization of organic matter



Figura 57. Physical-chemical analysis of organic matter