

**MoLG-JICA Technical Cooperation Project for Capacity
Development in Solid Waste Management in Palestine Phase-III
(CDSWMP-III)**

- A Technical Cooperation between Palestine (MoLG) and Japan (JICA) -

CDSWMP-III Output 5 Activities / Project Webinar Series

1st Webinar – Biomass Waste Composting

Proceeding of the 1st Webinar

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May 2021

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Disclaimer:

The 1st Webinar was held as a part of the ODA (Official Development Assistance) technical cooperation project between Palestine (MoLG; Ministry of Local Government, Palestine) and Japan (JICA; Japan International Cooperation Agency) with the aim of promoting information exchange in the field of solid waste management in Palestine.

The Proceeding of the 1st Webinar contains the lectures presented at the first Webinar and discussions. The contents of the lecture were made at the responsibility of each author and do not express the official position of the MoLG-JICA Project, MoLG, or JICA. Each lecture material was simply posted as it was created under the responsibility of each author. Abstracts were summarized by the Editor of the Proceedings based on the presentations. The copyright of each lecture material belongs to each author. The content of each lecture is tentative in nature and may change with future developments, so if a reader wants to cite a part or all of presentation, it is recommended to obtain the consent of relevant author.

- Series Editor

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Introduction

The Project for Capacity Development in Solid Waste management in Palestine Phase-III (CDSWMP-III) is targeting developing the technical capacity of the SWM institutions, namely MoLG and JSCs for SWM (13 JSCs in West Bank and 2 JSCs in Gaza). This Project overall goal is aiming at realization of waste reduction and minimization of waste amount over Palestine through implementing the Waste Reduction Program, (reduction of waste generation and various waste diversions from the waste stream flowing into landfills), and sustainable solid waste management systems are established in consideration of the environment and society. This goal is planned to be achieved through several Activities for minimizing waste generation and waste diversion throughout Palestine, where each JSC will prepare and start implementing a plan for minimizing waste generation, verification of effectiveness of methodologies of reduction in waste generation, waste diversion, reduction of waste disposed and appropriate disposal measures, drafting Law on 3Rs (Reduce, Reuse, Recycle) promotion is drafted for MoLG, and bylaws, regulations, standards, institutional design and/or guidelines necessary for promoting 3R practices, proposing for the next National Waste Management Strategy (2023-2027).

The Project will also formulate a National Waste Reduction Program including awareness raising program and appropriate SWM system designs for the entire Palestine, enhancing the Capacity for 3R promotion activities in MoLG-DJSC and JSCs, and support the JSCs in West Bank and Gaza through providing equipment and technical supports.

The Webinar Series will be organized for summarizing previous experiences and on-going activities in waste reduction, minimization, diversion and 3Rs promotion, and for sharing the knowledge and lessons among practitioners on the issues. We hope the webinar can contribute for improving solid waste management system in Palestine.

Suleiman Abu Mufarreh, Webinar Series Editor & Project Manager, MoLG

Mitsuo Yoshida, Webinar Series Advisor & Chief Advisor of the Project, JICA

May 2021

1. Date, Time and Venue

- Monday, 11th January, 2021 (Time in Palestine)
- 10:00am to 13:00pm
- Web Meeting System (Microsoft Teams)
- Webinar Moderator: Eng. Rawan Tayeh

2. Attendees

List of attendees including organizations and individuals is presented in Annex-A1.

3. Proceeding of Webinar Agenda

3.1. Presentations

The webinar agenda started by welcoming speech, then seven power point presentations were presented and lastly, an open discussion was held by attendees. See Annex-A2 for the full Webinar Agenda.

List of presentations of Part I: 1st Webinar on 11th January, 2021;

1. **Summary of previous pilot activities on composting in the Phase 2 of the Project for Technical Assistance in Solid Waste Management in Palestine.**

Yosrea Ramadan (MoLG)

2. **Experience of composting in Green Tulkarm Project.**

Aktham Badran (Tulkarm JSC)

3. **Experience of composting in Jenin JSC.**

Mohammad AlSadi (Jenin JSC)

4. **Experience of composting in Al Menya sanitary landfill.**

Majid Saree (Hebron &Bethlehem Higher JSC)

5. **Analysis of two composting businesses in Jericho.**

Late Abdel Jabbar Abu Halawah (Jericho JCspd) / presented by Suleiman Abu Mfarreh (MoLG)

6. **Latest information on biomass waste composting from ISWA.**

Mitsuo Yoshida (JICA)

7. **Discussions and Recommendations in the 1st Webinar.**

Summary: Rawan Tayeh (MoLG-JICA Project)

1st Presentation



Summary of previous pilot activities on composting in the Phase 2 of the Project for Technical Assistance in Solid Waste Management in Palestine.

By Eng. Yosrea Ramadan (MoLG)

ملخص للأنشطة التجريبية السابقة حول السماد العضوي في المرحلة الثانية من مشروع المساعدة الفنية في إدارة النفايات الصلبة في فلسطين

م. يسرية رمضان (وزارة الحكم المحلي)

The Project for Capacity Development in Solid Waste Management in Palestine



Composting Pilot Projects TASWM (2016-2018)

Prepared By: Eng. Yosrea Ramadan
Ministry of Local Government
General Directorate of JSC


Contents

- 1 Introduction
- 2 Pilot projects description phases (I), (II), (III)
- 3 Results and Discussion

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Introduction

- ❖ Waste reduction at sources is recognized as the top of the hierarchy of 3Rs in Palestine.
- ❖ Home composting using food waste/green waste is the most effective way to reduce the waste (in terms of weight) at different levels.



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Introduction cont.



- Project Specific Objectives :
 - To select the appropriate composter in Palestine
 - To determine optimal operational conditions to make compost
 - To implement home composting project at large scale (in terms of number of households)
 - To verify the methodology how to prove the effectiveness of home composting as a waste reduction technology
- Main goal :
 - To verify the effectiveness of home composting technology as one of alternatives of waste management technology in Palestine to achieve waste reduction at sources

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Plastic barrel Composter – used in Project



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Methodology and Equipment

Project Phase (I)	Project Phase (II)	Project Phase (III)
provisional study of home composting technology in winter	provisional study of home composting technology in summer	Implementation of large scale home composting project

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Project Phase (I)

Major objectives of this phase :

- ✓ To determine appropriate composter in Palestine.
- ✓ To determine appropriate fill (bed) materials in composter especially considering seasonal temperature difference.
- ✓ To determine optimal operation method of composter.

Targeted Area
 • Halhoul-Hebron Governorate
 • Aduyok Alfoqa and Alnweimeh : Jericho Governorate

Results and Discussion

1. Fabrication and preparation of composter :

Two types of composter (Type A and Type B) were fabricated using 80-100 L plastic containers.

2. Sites and households selection.

Planned study period	Site	Composter	Fill (Bed) materials	ID of composter (Household)
November 2015 - January 2016	Halhoul, Hebron governorate	Type A	A	AA1, AA2, AA3
		Type B	A	BA1, BA2, BA3
	Aduyok Alfoqa and Nawaimeh villages, Jericho governorate	Type A	B	BB1, BB2, BB3
		Type B	A	AA1, AA2, AA3
		Type A	A	BA1, BA2, BA3
		Type B	B	BB1, BB2, BB3



Type A composter Type B composter

1. For Type B composter: Ø18.4" x 6 rows of 1.0" x 1.5cm holes 10 to 15 cm apart all around the sides of the container.
 2. Dimension of the container: height: 0.8m, diameter (length/width): 0.40/0.3m, volume: 0.3m³

Fill Materials (A) mixture of dry yard waste like leaves, small branches, twigs, straw, sawdust alike)

Fill Materials (B) mixture of matured compost with any of humus, sawdust and alike

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Results and Discussion cont,

- Monitoring of Composting Process : the monitoring Process in Phase (I) lasted for 3 months (from Jan2016 - April 2016), while Phase (II) took place from August till November2016.
- Monitored parameters: Waste depth, odor, color, Ambient temperature, Moisture content, Temperature in the fill, Weight of waste added. Most frequently measured amounts (shown in the following slide)

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Project Phase (II)

Targeted Area

- Halhoul-Hebron Governorate
- Alduyok Alfoqa and alhweimeh Jericho Governorate

Major objectives of this phase were the same as Objectives of phase (I) but during summer season (August – November)

Changes from Phase (I) :

1. Placement of composter in some household moved to different place
2. Monitoring frequency was increased from every 10 days in the Phase I to every 3 days.
3. Weighing scale was provided to all households to measure weight of charged waste in composter.
4. Moisture contents were measured using a simple soilmoisture indicator, expecting more well moisture control.

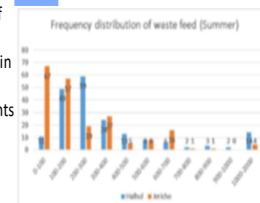
Preparation of Composters for phase (II)



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Results and Discussion

- ✓ Total number of measurements of waste charged into composters were 396 (191 in Halhoul and 205 in Jericho area).
- ✓ Most frequently measured amounts were 200-300 g/capita/day in Halhoul while 100 g/capita/day in Jericho area



Waste amounts fed into composter per person a day

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Results and Recommendations based on phase (I) and (II)

- According to a limited number of measurements the average amounts of waste reduced by home composting in summertime were 250 g/capita/day in Halhoul and 172 g/capita/day Jericho area while in wintertime 206 g/capita/day in Halhoul and 246 g/capita/day Jericho area.

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Results and Discussion Cont,

- Using two types of composters developed by the project with any of two kinds of bed materials was efficient as composting process was proceeded in both sites that recorded extremely high temperature in summertime or extremely low temperature in wintertime, although waste fill temperature was varied by several factors including waste quality, moisture content, and air (oxygen) concentration in the waste fill which were difficult or unable to control sufficiently in the project.

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Results and Discussion Cont,

- Composter placing : it is essential to place composter in sunny place to keep fill temperature as high as possible and to sustain composting reaction.
- The composter that recorded highest temperature in the project was some of BB composters in Jericho (matured compost). Also at the end of monitoring in wintertime some of BB composter showed blackish or dark brown color of filled waste at both sites and smell of waste in these composters were earthen smell, **so it is recommendable to use Type B composter with a matured compost as bed material if needed to produce compost quickly.**



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Project Phase (III)

Main objectives : To Implement home composting project at large scale in terms of the number of households who participate voluntarily in the project About 400~500 households are targeted

Targeted Area

- Mukhamas
- Beit Uhr Al Tahta
- Al Walajah,

Total distributed composters were 248, some were used for other purpose than composting or not used for the project due to insufficiency of organic waste households produced, and then 176 composters out of 400 were used to make compost.

Composters Distribution

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Beit Uhr Tahta

130

Al - Walajah

40

Mukahms

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Progress Evaluation

Interim evaluation of the project took place through :
 Conduction of survey, as interview survey for two groups of households.
Group A : households who were being participated in the project
Group B : households who had stopped or had not started the project because of following :

- ✓ Households had no interest to practice composting
- ✓ Difficulty in separating organic waste
- ✓ Requested hard work to mix waste in composter
- ✓ The unacceptable outlook and structure of composter

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Progress Evaluation

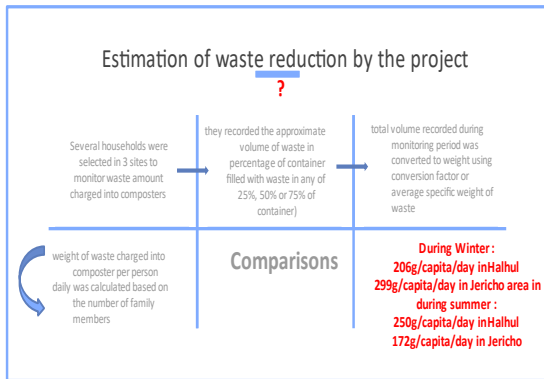
1. Knowledge and awareness of the environment and waste problems(Awarenesswise): households in 3 sites did not know waste management issues correctly as a whole and their awareness level on waste management was not high yet.
2. Knowledge of Composting technology : Many households expected or thought the contribution of compost were to produce fertilizer, one of waste management technology or to reduce waste amount. Particularly households in Al Walajah and Mukhamas thought that fertilizer production was the highest merits while households in BeitUhr Al Tahta thought that most merit of composting was to reduce amount of waste.

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Progress Evaluation

3. Interviews with Mayors of the JSC and VC:
 The mayors of the targeted areas feel some obligation to continue the projects and conveyed their intention to allocate some of their budget:
 - ✓ to conduct awareness raising campaigns
 - ✓ to allocate some of their staff to monitor the project
 - ✓ to plan expansion of the project in the current LGUs or other LGU in their JSCs

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Calculation of Cost Benefit of Home Composting Project

LGU/JSC	Bet Uhr Al Tahra Ramallah JSC	Muhams, NE&SE Jerusalem JSC	Al-Walajah, Bethlehem JSC
Population	1,000	250	750
Waste generation (t/capita/year)	0.24 (0.66kg/capita/day)	0.35 (0.4kg/capita/day)	0.32 (0.9kg/capita/day)
Waste reduction rate	20%	20%	20%
Total waste reduction (ton/year)	48	17.5	48
Tariff to JSC from LGU (NIS/ton)	-	311	108
Transportation cost (NIS/ton)	-	60	0
Collection cost (NIS/ton)	-	200	198
Landfill cost (NIS/ton)	-	50.5	32
Cost reduction (NIS/year)	-	10,876	11,904

Note: Ramallah JSC does not collect wastes (but private company), so information on the JSC in the Data Book is limited.

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- ### Findings
- Compost is effectively produced using home composter even in areas with extremely high or low temperature recorded.
 - Simplified composter made from plastic container with using locally obtained bed materials such as fallen leaves, dry twig, hay and saw dust can make compost.
 - It is necessary to place the composter in sunny side, especially in the area where lower temperature is recorded in winter as well as enough and proper operation of composter by moisture control; well mixing of waste (to enhance aerobic condition in the fill) and reducing waste size.
 - Lack of awareness of status and issues of waste management in their LGUs.
 - Roles and tasks of LGU/JSC were allocated, but they didn't pay so much active participation than expected.

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- ### Recommendations
- Selection and operation of composter: Composter made from existing plastic container can be used, and bed materials such as fallen leaves and dry twig are also easily obtained locally and suitable disseminate home composting widely.
 - Encouraging households to participate in composting projects: local communities should be encouraged to make compost by the LGUs through raising their awareness toward waste reduction and its importance as well as using some promoting incentives.

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- ### Recommendations
- Role of central government
 - (i) to establish instructions and policy toward home composting
 - (ii) to adopt effective approach to reduce waste at households level
 - (iii) Feasible waste reduction technology should be developed stepwise

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2nd Presentation

Experience of composting in Tulkarm JSC – Green Tulkarm Project

By Eng. Aktham Badran (Tulkarm JSC)

تجربة إنتاج السماد العضوي في مدينة طولكرم - مشروع الخضراء طولكرم
م. أكنم بدران (مجلس الخدمات المشترك لإدارة النفايات الصلبة- طولكرم)



The Project for Capacity Development in Solid Waste Management in Palestine



Tulkarm composting experience through "Green Tulkarm project"

Prepared By: Aktham Badran
11/1/2021

Introduction

Project: "Improving Health and Environmental Conditions in Tulkarm Governorate.

"Green Tulkarm" (2014-2017)

Implementing agency: Cesvi.

Donor: Italian Agency for Development Cooperation

The project involved the Municipality of Tulkarm and ten neighbouring villages ('Attil, Deir Al Ghosun, Qaffin, 'Illar, Iktaba, Anabta, Kafr al Labad, Beit Lid and Bal'a).

This area has a population of 152,539 inhabitants and is characterized by an agricultural vocation.

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Main Objective

- The main goal is the improvement of life quality and hygienic condition in the Governorate of Tulkarm through:
 - introduction of new collection systems based on separation by the individuals using the necessary facilities;
 - the empowerment of the local institutions responsible for waste management;
 - the promotion of campaigns to raise people's and scholars' environmental awareness;
 - rehabilitation of two illegal landfills.

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Introduction cont.

Project activities

The project targeted Tulkarm governorate with many activities as follow

- Trainings with institutions on SWM best practice
- Awareness campaign in 10 schools of the Governorate
- Training courses for schools' teachers on "environmental education"
- Creation and monitoring of 10 "environmental schools/clubs"
- Public awareness campaign (workshops, TV and radio spot, public days)
- Days of experience exchange for example inviting people from different regions of Palestinian territories is desirable.

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Introduction cont.

Project area and activities

The project targeted several Municipalities with the activities of separation and collection of green wastes and these are:

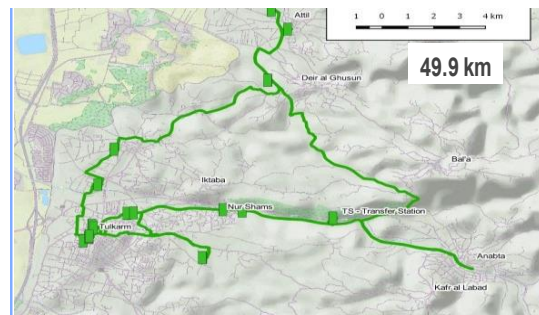
- Tulkarm municipality.
- 'Attil, Deir Al Ghosun, Qaffin, 'Illar, Baqa Al Sharquiya,
- Iktaba, Anabta, Kafr al Labad, Beit Lid and Bal'a).

This area has a population of 152,539 and is characterized by an agricultural vocation.

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Project activities

A1: Locating the areas where to install the collection bins (mapping)



Project activities/methodologies

Technical assessment for definition of baseline and work plan with stakeholders



project activities

procurement procedures for containers/bins, machineries and vehicles purchasing, selection of the contracting supplier



Project activities/methodologies

Distribution and installation of containers/bins in the strategic areas



Project activities

Training with stakeholder on SWM best practices



Project activities/ methodologies
Implementation of the recycling system

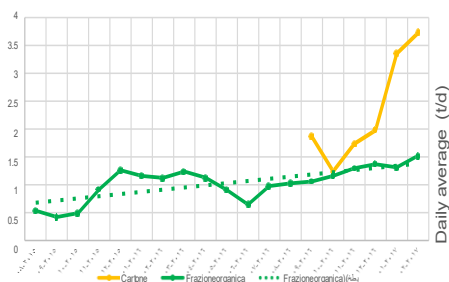


Project activities/ methodologies
Implementation of the recycling system





Comparison between organic & carton collection



Calculations for the cost of general waste collection and disposal NIS/ton

	Total	JSC	LGUs	
Service expenses	186.00	186.00	186	NIS/t
Collection	108.34	108.34	108	NIS/t
* Driver and workers	49.90	49.90		NIS/t
* Fuel	40.04	40.04		NIS/t
* Maintenance	18.40	18.40		NIS/t
Administration	8.67	8.67	8.67	NIS/t
Storage at the TS	12.00	12.00		NIS/t
Transfer to Zahra Al-Finjan	57.00	57.00	57	NIS/t
* Fuel	14.56	14.56	14.56	NIS/t
* Vehicles maintenance and driver	9.44	9.44	9.44	NIS/t
* Tariff	33.00	33.00	33	NIS/t

Calculations for the cost of carton waste collection only NIS/ton

Carton waste	Total	JSC	Partner	
	218.96	20.00	198.96	NIS/t
Collection	191.63	0.00	191.63	NIS/t
* Driver and workers	48.40	20	28.40	NIS/t
* Fuel	124.83		124.83	NIS/t
* Maintenance	18.40		18.40	NIS/t
* Administration	15.33	0.00	15.33	NIS/t
Storage at the TS	0.00	.00		NIS/t
Treatment	0.00	0.00	0.00	NIS/t
* Energy consumption (pulper)	ND	ND		
* Energy consumption (compactor)	ND	ND		

Calculations for the cost of green waste collection NIS/ton

Organic waste	Total	JSC	Partner	
	321.34	318.20	3.14	NIS/t
Collection	294.63	294.63	0.00	NIS/t
* Driver and workers	73.25	73.25	-	NIS/t
* Fuel	202.98	202.98	-	NIS/t
* Maintenance	18.40	18.40	-	NIS/t
Administration	23.57	23.57	0.00	NIS/t
Treatment	3.14	0.00	3.14	NIS/t
* Energy consumption (shredding machine)	3.14	-	3.14	NIS/t
* Cost for the Thinnabih cooperative	ND	-	ND	NIS/t

What did the project achieve?

the introduction of new collection system based on separation by the individuals using the necessary facilities.

contribute in decreasing the amounts to be transferred to Zahrat Al-Finjan sanitary landfill

reducing the cost of the SWM process which means lower cost per ton

cheap healthy fertilizers will be reflected in development in agriculture

Raising awareness and capabilities of market sellers, groceries, municipalities, teachers and schools,

Raising awareness and capabilities of Therasbah cooperatives ,members, farmers cooperatives

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Recommendations



1. Establish appropriate national policy deal with farm's organic wastes in composting process.
2. Subsidize composting sector to avoid losses and consequently failure.
3. Public private partnership "PPP" is one of the most important issue to gain good results.

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Future lessons and goals



1. Separation from the source is the first step to promote waste reduction.
2. Municipalities should work with JSC to establish a new tariff system in order to cover MSW management costs.
3. JSC can reduce costs of organic waste collection through the choice of a smaller collection vehicle, as the compact truck is not appropriate for long distances and small amounts of waste.
4. A decentralized management of organic waste by identifying one area for Alsha'rawiyah and one area for Wadi Alshâeer.

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3rd Presentation

Experience of composting in Jenin JSC

By Eng. Mohammed AISadi (Jenin JSC)

تجربة إنتاج السماد العضوي في جنين
م. محمد السعدي (مجلس الخدمات المشترك لإدارة النفايات الصلبة- جنين)



إنتاج الدوبال Composting



تقنيات التدوير وصناعة الدوبال العضوي
RECYCLING TECHNIQUES AND MAKING ORGANIC COMPOST




2021 ثنى محمد السعدي

أنواع ومصادر النفايات Waste Types



- النفايات المنزلية
- Municipal waste
- النفايات التجارية
- Commercial waste
- النفايات الصناعية
- Industrial waste
- النفايات الزراعية
- Agricultural waste
- النفايات الخطرة
- Hazardous waste

مكونات النفايات Waste Compositions



التدوير Recycling

- هو اجراء/مجموعة من الإجراءات لتحويل المواد المكونة للنفايات الى مواد او منتج جديد من خلال إعادة التصنيع
- It is a procedure / set of procedures for transferring the materials that make up the waste, i.e. new materials or product, through recycling

كيف؟؟؟ فصل النفايات Waste sorting

- » فصل النفايات من المصدر source separation
- » فصل ميكانيكي محطات تدوير النفايات (خطوط فرز النفايات) mechanical separation
- » المواد القابلة. الجافة (كرتون و ورق، بلاستيك، معادن، زجاج، خشب، اقمشة وغيره) dry waste (paper and cardboard)
- » المواد الرطبة (النفايات العضوية) wet waste (organics)

التدوير Recycling

فصل النفايات من المصدر Source separation

- تبدأ عملية الفصل من المصدر من النقطة الأولى لإنتاج النفايات (المنازل، المحال التجارية، المصانع، الخ
- The separation process starts at the source from the first point of waste generation (homes, shops, factories, etc.)
- تتم من خلال المواطنين، عمال الهيئات المحلية، عمال القطاع الخاص
- It is carried out by citizens, workers of local authorities, workers of the private sector
- هناك طرق متعددة من أهمها:
- There are multiple methods, the most important of which are

حاويات امام المنازل بالون مختلفة Curbside system
نقاط تجميع مركزية Drop-off Centers

التدوير Recycling

حاويات بالون مختلفة Curbside system

نقاط تجميع مركزية Drop-off center

التدوير Recycling

فصل النفايات من المصدر (جنين) Source separation in Jenin

- فصل نفايات الكرتون من مدينة جنين cardboard separation
- أقراص كرتون لفصل هذه النفايات Cages to separate
- نسبة فصل هذه المواد لم تتجاوز 1% Percentage did not exceed
- مشروع الجلمة " تدوير النفايات وتحويل المواد العضوية الى سماد" Al Jalameh project: "Recycling of waste and converting organic materials into fertilizer"
- فصل المواد القابلة للتدوير Separation of recyclables
- فصل النفايات العضوية وجمعها مع النفايات الزراعية لتحويلها الى سماد Segregate organic waste and combine it with agricultural waste to convert it into compost

التدوير Recycling

الفصل في الموقع ... محطات فرز النفايات Site separation| sorting plants

- ساحة استقبال empty area
- إزالة النفايات ذات الحجم الكبير Bulky Waste
- فاتحة أكياس bags opener
- مغناطيس لإزالة الحديد magnet to remove irons
- غربال لفرز النفايات العضوية Organics screening**
- خطوط نقل خاصة لفرز النفايات القابلة للتدوير transfer recyclables
- خط للنفايات المرفوضة التي يتم تحويلها للمكب transfer unrecyclable
- خطوط معالجة للنفايات وتحضيرها لنقلها لمصانع التدوير كل مادة Waste treatment, preparation and transportation lines for recycling plants, each material

التدوير Recycling

اهم المواد القابلة للتدوير التي يمكن الحصول عليها من خط الفرز (جنين) The most important recyclable materials that can be obtained from the screening line (Jenin)

- الكرتون والورق ويشكل حوالي 14% Carton and paper, which makes up about 14%
- البلاستيك بأنواعه المختلفة ويشكل حوالي 9% Plastic of all kinds, which makes up about 9%
- المعادن بأنواعها المختلفة لا تزيد عن 3% Minerals of all kinds, not more than 3%
- نسبة فرز هذه المواد من خطوط الفرز لا تتجاوز 12% من النفايات الكلية وتحتاج الى تحضير ومعالجة مسبقة قبل إرسالها للمصانع وذلك لاختلاطها بالنفايات الأخرى قبل عملية الفرز
- The percentage of sorting these materials from the screening lines does not exceed 12% of the total waste and it needs to be prepared and pre treated before it is sent to the factories for mixing with other wastes before the sorting process

التدوير Recycling

مراحل تدوير الكرتون والورق Paper recycling stages

التدوير Recycling

• تدوير البلاستيك... أنواع البلاستيك Plastic types

1. PET
2. HDPE
3. PVC
4. LDPE
5. PP
6. PS
7. Others





التدوير Recycling

• تدوير المعادن... الحديد، الألمنيوم، النحاس.. وغيرها Metal recycling iron, aluminum, copper ... and others

- يتم فرز الحديد بواسطة مغناطيس Iron is sorted by magnets
- المعادن الأخرى تفرز بواسطة عمال من خلال خطة فرز Other minerals are excreted by workers through a sorting scheme
- حيث يتم تجميع وتنظيف المعادن من الشوائب وتنقل إلى المصانع are collected and cleaned of impurities and transported to factories



التدوير Recycling

• النسبة الأعلى (<50%...)... النفايات العضوية is (50%) The highest percentage


فصل هذه المواد

- مخلفات الطعام Food
- مخلفات الأشجار Trees
- الأعشاب Agricultural
- مخلفات الحيوان Animals
- وغيرها Others

• كيف ??? How

• تحلل هذه المواد العضوية بطرق بيئية مناسبة... (تحلل هوائي / لاهوائي) Decomposition of these organic matter under suitable environmental conditions (aerobic / anaerobic degradation)

(الدبال - السماد العضوي - الكومبوست - Compost)



الدبال compost

• للحصول على أفضل واكبر كمية من الدبال يجب توفير الظروف البيئية المناسبة لذلك

To obtain the best and largest amount of Dubal, appropriate environmental conditions must be respected

- بيولوجية - biological conditions
- كيميائية - chemical conditions
- فيزيائية - physical conditions




الدبال compost

• توفير الظروف البيولوجية المناسبة تلعب دورا رئيسيا في تحلل المواد العضوية

Providing appropriate biological conditions plays a major role in decomposing organic matter.

- الفطريات Fungi
- البكتيريا Bacteria
- ديدان الأرض Earthworms
- الحشرات Insects




الدبال compost

• هناك العديد من العوامل التي تؤثر على البيئة الكيميائية للدبال

There are many factors that affect the chemical environment of compost

- غذاء كافي - مصدر للكائنات الحية الدقيقة of Adequate food - a source of microorganisms
- كمية متوازنة من العناصر الغذائية A balanced amount of nutrient
- كمية مياه كافية Sufficient amount of water
- اكسجين oxygen
- درجة الحموضة PH



الدبال compost

Physical conditions الظروف الفيزيائية

- حجم المواد Size of material
- الحرارة temperature
- حجم وشكل الكومة shape



الدبال compost

خطوات عمل الدبال للنفائات البلدية large scale

- إزالة النفائات ذات الحجم الكبير bulky waste
- فرم وطحن النفائات للأحجام المناسبة shredding
- التخيل Screening
- فصل الحديد بواسطة مغناطيس Iron separation
- خلط المواد مع إضافة ماء Mixing with water
- عمل الدبال بناء على التقنية المعتمدة Production
- تخيل نهائي، تعبئة وتغليف، تخزين، تسويق، استخدام Final sieving, packaging, storage, marketing, use




الدبال compost

الأنواع والتقنيات Types and techniques

- نظام صفوف/شورة windrow
- الكومة The heap
- الوعاء او الصندوق The container or the box
- الدبال اللاهوائي Anaerobic compost

الدبال compost

Figure 2: Windrow Composting Using a Windrow Turner










الدبال compost


الدبال المنزلي Small scale ... home composting

نظام اكوام بسيطة Simple piles system

الدبال المنزلي Small scale ... home composting

نظام اكوام بسيطة Simple piles system

Small scale home composting الدبال المنزلي

Box system نظام صندوق او برميل



Small scale home composting الدبال المنزلي

Plastic container حاوية بلاستيك



الدبال compost

التحديات Challenges

- التسويق ومدى قبول السوق المحلي للمنتج Marketing and the extent to which the local market accepts the product
- جودة الدبال المنتج Quality
- الطريقة التقنية Technical method
- توفر الخبرات Experiences
- الروائح الكريهة Bad odors
- التحكم والتقليل من الملوثات خلال عمليات التشغيل Control and monitor
- التكلفة Cost

التقرير الفني

شكرا
Thank you

4th Presentation

Experience of composting in Al Menya sanitary landfill

By Eng. Majid Saree (Hebron-Bethlehem Higher JSC)

تجربة إنتاج السماد في مكب المنيا الصحي
 م. ماجد الصريع (المجلس الأعلى للخدمات المشتركة - الخليل وبيت لحم)

The Joint Services Council for Solid Waste Management for Hebron and Bethlehem Governorates (JSC -H&B)

JSC-H&B Experience in Compost Production

Majed Al Sari'
 Environmental Specialist
 January 11th, 2021

Waste Generation:
 Hebron 0.69 kg/capita/day
 Bethlehem 0.79 kg/capita/day

Waste Characteristics:

Waste Fraction	Percentage (%)
Organics	46.0
Plastics	18.3
Paper	10.9
Textile	6.1
Glass	2.3
Metal	1.8
Others	14.6

Waste Quantities:
 Hebron = 1200 TPD, organic fraction = 552 TPD

Organic Wastes and Compost:

- Compost: is a natural process of decomposition of organic matter (such as food wastes, animal manure, crop residues ...etc.) under controlled conditions, which involves degradation of organic matter into a stable, homogenous humus-like substance called compost.

Reasons for Composting:

- Organic fraction represent around 46% of the total municipal waste in Hebron and Bethlehem governorates
- Reduce waste stream that goes to the landfill and expand the landfill lifetime;
- Around 70% of the organic fraction is compostable;
- Organic components in landfill cause higher gas (mainly methane) and leachate production and instability of waste body;
- Composting is a sustainable method to use biological resources with an useful and environmental aim.

JSC-H&B Experience:

- Started composting as pilot using vegetables and fruits waste, animal manure and sawdust In Cooperation with Rostock University and Al-Ja'ar Engineering Co.;
- Cooperation with agricultural societies like Dura Cooperative Society for Development of Protected and Irrigated Agriculture;
- Expanded to include organic fraction of solid waste of particles finer than 2 cm after sorting using trommel;
- Currently, compost mixtures are composed of vegetables and fruits waste, organic materials sorted finer than 2cm and green waste chips;
- Methods used: windrow and piles



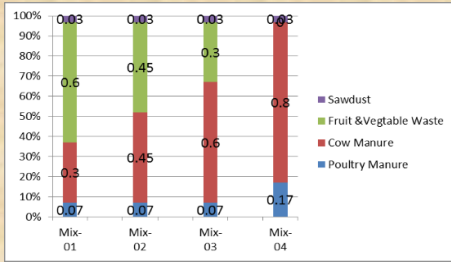
Window composting



Pile composting

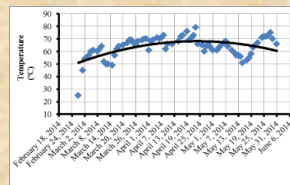


Examples of Compost Mixtures:

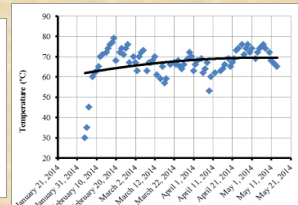


**Parameter Control:
-Temperature:**

Mix -01

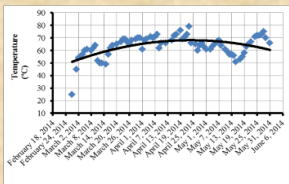


Mix-02

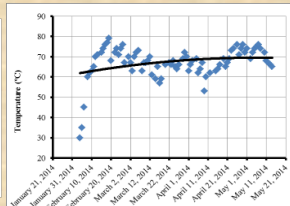


**Parameter Control:
-Temperature:**

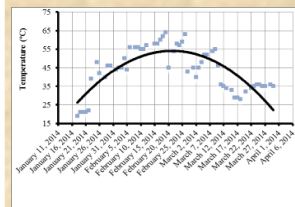
Mix -01



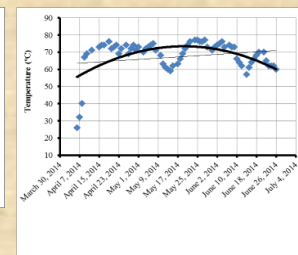
Mix-02



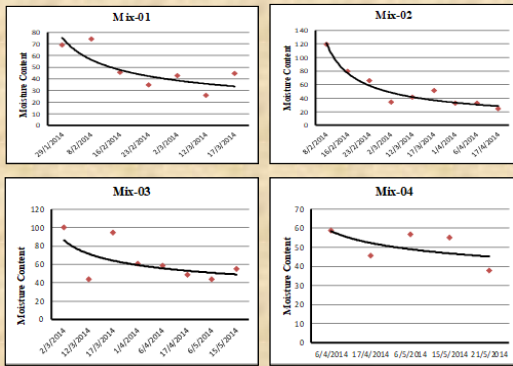
Mix -03



Mix-04



- Moisture Content



Results:

Sample No.	Mix No.	Test results				
		pH	Ec (ds/m)	Total Nitrogen (%)	Phosphorus (ppm)	C/N Ratio
1-	Mix 1	9.48	8.69	1.09	243.82	10.0
2-	Mix 2	9.51	9.36	1.23	197.61	12.0
3-	Mix 3	8.74	6.12	1.17	165.80	9.0
4-	Mix 4	10.03	10.72	1.25	255.39	10.0
Average		9.44	8.72	1.19	215.66	10.25
PSI (1)		5-8.5	≤4 ^a	^b	NS	^c
SD		0.46	1.67	0.06	36.00	1.09
JSI (2)		≤7.5	≤15	≥1.5	NS	≤15

(1) Source: Palestinian Standards Institution (PSI), 2012. Standard specification for organic fertilizer (compost) PS/2652:2012;

^a For application below the surface of 5cm, and no limits for application at depth of 20cm below the surface;

^b as announced by the producer; 25%;

^c as announced by the producer;

NS: not specified

(2) Source: Jordanian Standards Institution (JSI), Technical regulation for organic fertilizers, Standard no 962/2000, Amman, Jordan.

Next Step:

- Install and operate trommel for organic sorting with opening size of 4.5cm. All organics passing this sieve will be composted;
- Install and operate trommel with 1.5cm opening size for screening the matured compost.



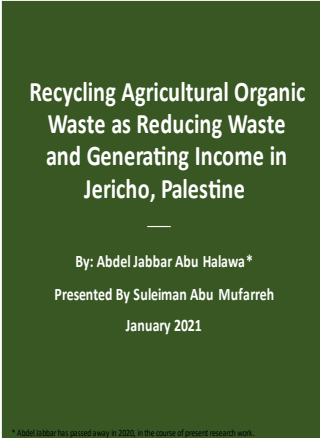
Thank You

5th Presentation Title

Recycling Agricultural Organic Waste as Reducing Waste and Generating Income in Jericho, Palestine.

By: late Abdel Jabbar Abu Halawah (Jericho JCspd) / presented by Suleiman Abu Mufarreh (MoLG) / presentation slides prepared by Mitsuo Yoshida (JICA)

إعادة تدوير المخلفات الزراعية العضوية لتقليل الفاقد وتوليد الدخل في أريحا، فلسطين
المرحوم عبد الجبار أبو الحلاوة (المدير التنفيذي السابق لمجلس الخدمات المشترك- أريحا والأغوار)
قدم العرض سليمان أبو مفرح (وزارة الحكم المحلي)




Recycling Agricultural Organic Waste as Reducing Waste and Generating Income in Jericho, Palestine

By: Abdel Jabbar Abu Halawa*

Presented By Suleiman Abu Mufarreh

January 2021

* Abdel Jabbar has passed away in 2020, in the course of present research work.



Background

- Jericho Governorate, or Jericho and Jordan River Rift Valley area, is known as major agricultural area in Palestine.
- Approximately 25,000 ton of agricultural waste (green plant waste and animal manure) is produced annually; the agricultural waste is mostly left in land, burned, or just disposed of around agricultural areas.
- In order to reduce the disposal amount of waste and protect the environment, there is a strong need to proper treatment of agricultural waste

Methodology

- There are two recycling facilities for treating and recycling agricultural organic waste in Jericho city.
- The first step in conducting the study was to review of all previous related studies and reports about agricultural organic waste recycling in West Bank. The available information have been thoroughly checked and analyzed to form a full understanding and assessment of the collected and obtained data.
- Meetings and interviews with key persons who are working in these two facilities have been conducted to collect the required information from their acquired experience which is essential of accumulation of required data.
- Finally, the financial data about all possible costs and revenues was identified, analyzed and presented.



EU project SC2W

3

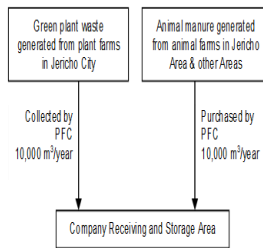
Case Study 1: Palestinian Fertilizers Company (PFC)

- The company was established in the year 2010, and is located south east Jericho city, the total area of the facility is about 60 dunums (60,000 m²), out of which 2,000 m² for the composting plant.
- The company is owned by Palestinian investors and is managed by administrative board. The investment cost was about 1.25 million USD, out of them 400,000 USD for equipment.
- The production capacity of the recycling plant is about 12,000 m³ per year, and the main organic waste used is animal and green plant waste.
- The operation area is divided into different components for mixing, compost fermentation, packing, and storage. The company started marketing its products from July 2013.



Agricultural waste stream and composting in PFC

- Used raw materials are either purchased or collected from farm yard in Jericho governorate.
- Green plant waste is collected directly by the company from farms in Jericho city for no price; the company just hires the cost of the collection.
- For animal organic solid waste (manure), the manure is purchased from animal farms in Jericho governorate, and part is purchased from other areas in west bank.
- The prices vary from 45 to 55 USD per cubic meter depending on the source.



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Total Operation Cost of PFC plant (2014)

Item	Cost (NIS) / y	Cost (USD) / y	Remarks
Manpower	126,000	36,000	10 workers (6 months)
Raw Materials (animal waste)	900,000	257,143	10,000 cubic meter
Raw Materials (plant waste)	0	0	10,000 cubic meter
Electricity	30,000	8,571	
Water	36,000	10,286	
Raw Materials (Packages)	480,000	137,143	
Maintenance	50,000	14,286	
Transportation Cost	75,000	21,429	
Other Costs	167,300	47,800	
Depreciation Cost	140,000	40,000	
Total Annual Cost	2,004,300	572,657	

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Selling of the "Compost Baladna" (PFC)

- The company produces only one size 25 liter package, each packaged is sold for 7 NIS. The commercial name is "Compost Baladna". The total annual production is about 480,000 packages.
 - Unit price of packaged compost product: 6.5 (NIS)
 - Gross sales: 3,120,000 (NIS); 891,429 (USD)
 - Profit = 891,429 - 572,657 = 318,772 (USD/year)
 - Gross profit margin rate: 35.8%

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Case Study 2 Agricultural Engineers Home Society (AEHS)

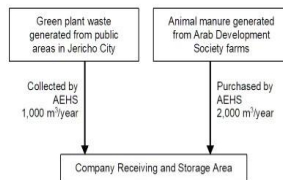
- The society recycling plant is a small scale plant established on 2011 is located east of Jericho city, the total area of the facility is about 5 dunums (5,000 m²), out of which 1,000 m² for the composting plant.
- The operation area is divided into different components for mixing, compost fermentation yard, packing, and storage.
- The society was established in 2003, it has 22 member (agricultural engineers), and is managed by administrative board of 5 members. The investment cost of the facility was about 220,000 USD, funded by the Grassroots Human Security Projects.
- The production capacity of the recycling plant is 2,000 m³ per year, and the main organic waste used is animal manure and green plant waste.



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Agricultural waste stream (AEHS)

- Animal manure is purchased from Arab Development Society farms; AEHS is collecting all the generated animal manure for a fixed price (9 USD) per cubic meter.
- Green plant waste is collected directly by Jericho municipality from Jericho curbside and public spaces and sent this waste to the AEHS storage area for free of charge.



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Total Operation Cost of AEHS plant (2014)

Item	Cost (NIS) / y	Cost (USD) / y	Remarks
Manpower	80,400	22,971	6 workers/ 4 months per year. 1 driver /12 month per year
Raw Materials (animal waste)	63,000	18,000	2,000 cubic meter
Raw Materials (plant waste)	0	0	1,000 cubic meter
Electricity	1,150	329	
Water	6,000	1,714	
Fuel	24,000	6,857	
Raw Materials (Packages)	37,200	10,629	
Maintenance	4,000	1,143	
Land Rent	2,500	714	
Waste Transportation	1,800	514	
Other Costs	2,000	571	
Depreciation Cost	75,000	21,429	
Total Annual Cost	297,050	84,871	

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Selling the compost products (AEHS)

- The society produces only one size 20 kg package, each packaged is sold for 6.0 NIS.
- The total annual production is about 40,000 packages. About 858 m³ of the product is also sold without packaging.
 - Unit price of packaged compost: 6.0 (NIS/pack)
 - Total selling: 240,000 (NIS) (= 68,571 (USD))
 - Nonpackaged compost product: 165 (NIS/m³)
 - Gross sales: 141,570 (NIS) (= 40,449 (USD))
 - Profit = 68,571 + 40,449 - 84,871 = 24,149 (USD/ year)
 - Gross profit margin rate: **22.2%**



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Discussion (1) - General

- The two facilities are getting financial benefits from the recycling of the agricultural organic waste as an organic fertilizer (compost product).
- The difference in revenues between the two facilities could be justified by the difference of interest.
- For the Palestinian Fertilizers Company (PFC); the project is an investment project by private sector, while for the Agricultural Engineers Home Society (AEHS) it is a farmers supporting cooperative project.



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Discussion (2) - Cost

- The main reason of the high production cost in the Palestinian Fertilizers Company (PFC) is the high price of the animal waste (manure) in Jericho area.
- The Agricultural Engineers Home Society (AEHS) purchases the manure from the Arab Development Society where the recycling facility set relatively low price.



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Discussion (3) - Profit

- The PFC business has a higher gross profit margin than the AEHS business, and it seems that this is due to the difference in business scale.
- The difference in the selling price between the two composting facilities could be justified by; the difference of interest between the two facilities, and the difference of manure prices.



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Discussion (4) – Marketing Problems

- Both facilities share the same marketing problems mainly due to;
 - (i) farmers are not aware enough of using compost instead of chemical fertilizers,
 - (ii) the absence of laws and economic instrument for promoting the usage of compost product, and
 - (iii) the competition of the Israeli compost which is sometime giving to the farmers in very low prices about 3 USD per cubic meter.



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Discussion (5) - Security

- On the other hand, the Israeli security ban on imported chemical fertilizer has deleterious effects on Palestinian agriculture, which indicates a necessity of some self -support of fertilizer, and compost is expected to be one of the measures.
- There is no Palestinian standard authorized for compost production, which leads to instability of the compost quality and price setting.



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Conclusions and Recommendations

- Recycling of agricultural organic waste could be not only reducing the amount of solid waste disposal but creating a source of income in Palestine.
- This needs revision of the current legal framework for promoting the investments and the private sector participation in this field, which gives some intensives for the use of ecofriendly compost products by the farmers and rising of farmers' awareness on the environment and economy.
- It is necessary for decision makers to consider the recycling of agricultural organic waste in the strategic plans, and to allocate sufficient resources to reach this goal as mentioned in the National Solid Waste Management Strategy (2017-2022).
- The current legal framework should update and modify to encourage such type of recycling activities.
- It is a recommendation to the Ministry of Agriculture to promote awareness of the benefits of compost in its awareness and guidance programs



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In memoriam - Abdel Jabbar AbuHalawa



Mitsuo Yoshida, Abdel Jabbar Abu Halawa, and AbMferreh

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6th Presentation

Latest information on biomass waste composting from ISWA

By: Dr. Mitsuo Yoshida (JICA)

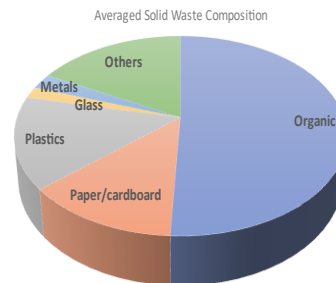
أحدث المعلومات حول تحويل نفايات الكتلة الحيوية إلى سماد من المؤسسة الدولية للنفايات الصلبة
 د. ميتسوا يوشيدا (وكالة التعاون اليابانية الدولية)

Summary of Today's Webinar:
 How can we develop municipal waste
 composting in Palestine?

Mitsuo Yoshida, Chief Advisor
 MoLG-JICA Project for Capacity Development in SWM in Palestine Phasell
 1st Project Webinar, January 11, 2021

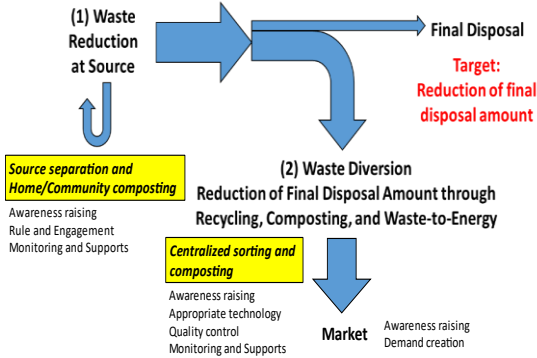


Waste reduction



More than 2,200 ton/day is generated in West Bank and more than 1,400 ton/day is generated in Gaza.
 ↓
 Waste Reduction Policy
 ↓
 Organic = **composting**
 Paper/cardboard, Plastic, and the others = **material recycle**
 ↓
 Pilot Projects

Two channels of Waste Reduction



Points to be discussed



3.2. Discussions and Recommendations in the 1st Webinar

Summary by: Eng. Rawan Tayeh (MoLG-JICA Project)

المناقشات والتوصيات للندوة الأولى
م. روان تايه (مشروع التعاون الفني جايا-وزارة الحكم المحلي)

ملخص النقاشات

- Very important; regulating the role of ministry of agriculture for the use of national produced compost complying with PSI for Palestinian farmers (buy from producer and sell or distribute to farmers)
تنظيم دور وزارة الزراعة فيما يتعلق باستخدام الكومبوست المنتج محلياً المطابق لـ PSI لصانعي الإطارات الفلسطينيين (الشراء من المنتج والبيع أو التوزيع على المزارعين)
- Compost production must be strengthened by public awareness activities targeting citizens and especially farmers on the importance of managing organic waste and agricultural waste.
يجب تعزيز إنتاج الكومبوست من خلال أنشطة توعية عامة تستهدف المواطنين وخاصة المزارعين حول أهمية إدارة النفايات العضوية والمخلفات الزراعية.
- The formulation of a formal report that summarizes all the previous experiences in composting in Palestine. The report should also include the current status and challenges and the future requirements to guarantee the success of any future projects/ initiatives.
صياغة تقرير رسمي يلخص جميع التجارب السابقة في مجال التسميد في فلسطين. يجب أن يتضمن التقرير أيضاً الوضع والتحديات الحالية والمتطلبات المستقبلية لضمان نجاح أي مشاريع / مبادرات مستقبلية.
- These experiences should be published in one data book in Arabic to enhance knowledge exchange between all parties involved in MSW management especially organic waste composting.
يجب نشر هذه الخبرات في كتاب بيانات واحد باللغة العربية لتعزيز تبادل المعرفة بين جميع الأطراف المشاركة في إدارة النفايات الصلبة البلدية وخاصة تحويل النفايات العضوية إلى سماد.
- Holding further webinars to share any other experience such as Gaza's experience.
عقد المزيد من الندوات عبر الإنترنت لمشاركة أي تجربة أخرى مثل تجربة غزة

4. Proposed Action Items / Next Steps / Remaining Tasks

1. Formal letter/ report to emphasize on the current challenges and future opportunities in composting.
عمل تقرير أو رسالة رسمية للتأكيد على التحديات الحالية والفرص المستقبلية في عملية التسميد
2. Arrange another webinar to give a chance for other experiences.
ترتيب ندوة أخرى عبر الإنترنت لإعطاء فرصة لتجارب أخرى.

Annex-1: Participant List of the 1st Webinar

Name	Organization	Name	Organization
Dr. Mitsuo YOSHIDA	CA- JICA	Eng. Mostafa Hameed	N&NW Jerusalem JSC
Ms. Reiko Shindo	PC -JICA	Eng. Basel Odeh	Tubas JSC
Mr. Suleiman Abu Mufarreh	PM -MoLG	Mr. Sa'ed Abuzant	Nablus JSC
Mr. Ziyad Tawafsheh	DPM -MoLG	Eng. Atied Afaneh	Qalqilya JSC
Eng. Yosrea Ramadan	MoLG	Eng. Aktham Badran	Tulkarm JSC
Eng. Rawan Tayeh	JICA	Eng. Iyad Abu Rdaineh	Bethlehem JSC
Eng. Majeed Saree	H-B Higher JSC	Eng. Mohamed Is'ayed	Jericho JSC
Mr. Ahmad Sukar	H-B Higher JSC	Dr. Mohammed Alsayed	Najah National University
Eng. Mohamed Sadi	Jenin JSC	Dr. Abdelrahim Abusafa	Najah National University
Eng. Hussein Abuoun	Ramallah JSC	Dr. Rashed Alsa'ed	Birzeit University
Mr. Ahmed Shouaibi	Salfit JSC	Eng. Saed Dagher	Private Sector
Eng. Abdelhay Arafah	Hebron JSC	Eng. Haitham Alzughair	PARC
Prof. Amer Hamouz	Najah National University	Mr. Izzat Zeidan	PARC
Dr. Tahseen Sayara	Khadoori University	Eng. Samir Matar	MDLF - Gaza
Dr. Ali Barhoum	Gaza KRM JSC	Eng. Ayat Attalla	Environment Engineer
Eng. Abdelrahim Abulqumboz	North Gaza JSC	Mr. Sa'ed Rabee'	NE&SE Jerusalem JSC

Annex-A2: Agenda:



مشروع تطوير القدرات في إدارة النفايات الصلبة في فلسطين - المرحلة الثالثة
The Project for Capacity Development in Solid Waste Management in Palestine Phase-III

أجندة اللقاء عبر الإتصال المرئي حول إدارة النفايات العضوية وإنتاج السماد المحلّي (الذّبال)

Agenda of Biomass and Composting Webinar

الأولاللقاء 1st Webinar

Monday, 11/01/2021, 10:00 AM

المتحدّثون	الموضوع	التوقيت
	تأكيد الإتصال والحضور	10:05-10:00 ص
Eng. Yosrea Ramadan Project Member/MoLG م. بسيرة رمضان عضو مشروع/ وزارة الحكم المحلي	Summary of previous pilot activities on composting in Phase II of project "Technical Assistance in solid waste management in Palestine" ملخص للأنشطة التجريبية السابقة حول إنتاج السماد العضوي في المرحلة الثانية من مشروع "المساعدة الفنية في إدارة النفايات الصلبة في فلسطين"	10:12-10:05 ص
Eng. Majed Alsaree' Technical Engineer/ H&B Higher JSC م. ماجد الصريع مهندس فني/ المجلس الأعلى للخدمات الخليل وبيت لحم	Experience of composting in Almenya sanitary landfill تجربة إنتاج السماد العضوي في مكب المنيا الصحي	10:20-10:13 ص
Eng. Aktham Badran Executive Director/Tulkarm JSC م. أكثم بدران المدير التنفيذي/ مجلس خدمات طولكرم	Experience of composting in Tulkarm JSC – Green Tulkarm Project تجربة إنتاج السماد العضوي في مدينة طولكرم - مشروع طولكرم الخضراء	10:28-10:21 ص
Eng. Mohammed ALSadi Technical Engineer/ Jenin JSC م. محمد السعدي مهندس فني/ مجلس خدمات جنين	Experience of composting in Jenin JSC تجربة إنتاج السماد العضوي في جنين	10:36-10:29 ص
Late Abdul-Jabbar Abu Halawah presented by PM Jericho JSC الراحل عبد الجبار أبو حلاوة قدامها مدير المشروع مجلس خدمات أريحا	Analysis of two composting businesses in Jericho تحليل تجربتين لإنتاج السماد العضوي في أريحا	10:44-10:37 ص
Dr. Mitsuo Yoshida Chief Advisor/JICA د. ميتسوا يوشيدا وكالة التعاون اليابانية الدولية	Latest information on biomass waste composting from ISWA أحدث المعلومات حول تحويل نفايات الكتلة الحيوية إلى سماد من المؤسسة الدولية للنفايات الصلبة	10:52-10:45 ص
المتحدّثون والحضور	Discussions and Recommendations نقاش مفتوح لاستقبال الأسئلة والإجابة عليها	13:00-11:05