

# The BLOOM School Box

## Learning Scenario

### The benefits of composting- How can we produce organic fertilizer in our school garden

*This learning scenario is part of the BLOOM School Box, which consists of a set of learning scenarios combining bioeconomy into science, technology, engineering and mathematics (STEM) subjects.*

*This resource was developed as part of the BLOOM “Teach bioeconomy!” competition and is one of the winning entries that have been evaluated by an international team of bioeconomy experts and expert teachers. This learning scenario has been developed as part of the BLOOM project.*



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## Learning scenario summary

After an introduction about bioeconomy and its purpose, students learn about biomass and biomass-based products. Then, they compare chemical and organic fertilizers and discuss both positive and negative effects. Students also create their own composting with the school's organic waste.

<b>Subject</b>	<b>Interdisciplinary subject involving biology, chemistry, mathematics and bioeconomy</b>
<b>Topic</b>	<b>Benefits of composting our organic waste and producing organic fertilizer for the environment; setting up a composting bucket in the school garden</b>
<b>Age of students</b>	<b>15-18</b>
<b>Preparation time</b>	<b>4 hours (2h+2h for flipped classroom)</b>
<b>Teaching time</b>	<b>10 hours (including outdoor activities)</b>
<b>Online teaching material</b>	Symbaloo for useful links, School's blog and a Padlet for assessment.
<b>Offline teaching material</b>	Paper, a composter for recycling the garden waste, some brochures and posters for informing the other students of the school, plastic gloves, diggers and small shovels.
<b>Bioeconomy resources used</b>	<p>Links with all the bioeconomy resources used for this learning scenario:</p> <ul style="list-style-type: none"> <li>• Management of waste in Greece: <a href="http://www.wwf.gr/images/pdfs/fact_sheet_sterea_apovlita.pdf">http://www.wwf.gr/images/pdfs/fact_sheet_sterea_apovlita.pdf</a></li> <li>• About recycling: <a href="https://recycling-is-good.weebly.com/eta-alphanualphakappaupsilonkappalambdaomegasigmaeta-sigmatauetanu-epsilonlambdalambdaalphadeltaalpha.html">https://recycling-is-good.weebly.com/eta-alphanualphakappaupsilonkappalambdaomegasigmaeta-sigmatauetanu-epsilonlambdalambdaalphadeltaalpha.html</a></li> <li>• The problem of eutrophication: <a href="https://www.rodiki.gr/article/53135/to-problhma-toy-eytrophismoy">https://www.rodiki.gr/article/53135/to-problhma-toy-eytrophismoy</a></li> <li>• A presentation about eutrophication: <a href="https://www.slideshare.net/harakida/ss-19946805">https://www.slideshare.net/harakida/ss-19946805</a></li> <li>• Fertilizers: <a href="https://www.elke.teicrete.gr/LinkClick.aspx?fileticket=cL8V61J_rfc%3D&amp;t_abid=670">https://www.elke.teicrete.gr/LinkClick.aspx?fileticket=cL8V61J_rfc%3D&amp;t_abid=670</a></li> <li>• A study about biomass (page 4): <a href="https://docplayer.gr/16654366-Anotato-tehnologiko-idryma-kritis-sholi-tehnologias-geoponias-tmima-fytikis-paragogis-ptyhiaki-ergasia.html">https://docplayer.gr/16654366-Anotato-tehnologiko-idryma-kritis-sholi-tehnologias-geoponias-tmima-fytikis-paragogis-ptyhiaki-ergasia.html</a></li> <li>• Energy from biomass (page 4): <a href="http://www.cres.gr/energy-saving/images/pdf/biomass_guide.pdf">http://www.cres.gr/energy-saving/images/pdf/biomass_guide.pdf</a></li> </ul>

- About composting:  
<https://newland.com.gr/%ce%ba%ce%bf%ce%bc%cf%80%ce%bf%cf%83%cf%84%ce%bf%cf%80%ce%bf%ce%b9%ce%b7%cf%83%ce%b7/>
- Ways and means of composting: <https://biokipos.blogspot.com/p/blog-page.html>
- A video with instructions about composting:  
<https://www.youtube.com/watch?v=XoRmiULUNxg>
- General instructions from WWF for making a compost:  
[http://www.wwf.gr/images/pdfs/pe/agriculture\\_material\\_georgia\\_organic\\_farminggreece2001.pdf](http://www.wwf.gr/images/pdfs/pe/agriculture_material_georgia_organic_farminggreece2001.pdf)
- Instructions from GREENPEACE about Composting and worm bins:  
<https://www.greenpeace.org/archive-new-zealand/en/take-action/green-your-life/composting/>

## Relevant trends

*Relevant trend(s) the Scenario is intended to respond to. E.g. at <http://www.allourideas.org/trendiez/results>*

- **Flipped Classroom:** Students familiarize themselves with the basic concepts of composting at home. The time spent in classroom is used to reflect, discuss and develop the assigned topic. (Students will prepare the learning materials at home in two phases).
- **Project-Based Learning:** Students are assigned to fact-based and problem-solving tasks as well as the group work. This kind of a learning approach is expected to transcend the traditional subjects (Students will learn how to create their own compost).
- **Student Centred Learning:** Students and their needs are at the centre of the learning process (Students will work with minimal guidance and will take many initiatives).
- **Outdoor Education:** Students will be engaged in the activities outside the classroom (There will be two out-of-school visits)
- **Collaborative Learning:** A special emphasis is put on the group work. (Every stage of the process will be conducted in groups)

## Aim of the lesson

*What are the main objectives? What will students achieve by the end of the lesson?*

Students will:

- Learn about the purpose of bioeconomy.
- Acquire knowledge about the biomass and the products we can get from it.
- Investigate how plants with conventional fertilizers are grown.

- Learn about the components of conventional fertilizers together with their effect on crops, aquifers and the sea with the special focus on the phenomenon of eutrophication and algae.
- Obtain knowledge about the potentials of recycling and the importance of composting.
- Learn how to distinguish the negative effects of conventional fertilizers from those produced by biomass.
- Create their own composting in the garden of the school using the necessary means.

## Activities

<b>Name of activity</b>	<b>The detailed description of the activity</b>	<b>Time</b>
1 <sup>st</sup> lesson	<p>During the first lesson, using the method of the flipped classroom, teachers will provide students with a set of links using <a href="mailto:https://www.symbaloo.com/mix/aboutbioeconomy%20via%20@symbaloo">mailto:https://www.symbaloo.com/mix/aboutbioeconomy%20via%20@symbaloo</a> Symbaloo. The links will lead them to the websites, from which the students will learn about fertilizers and their effect on crops and the environment in general. Students will also find information about biomass and composting.</p> <p>They will have one week to study the materials at home and to prepare themselves for the project. A questionnaire will be provided to help them with the basic concept of the topic in order to focus on the essence of the information. (See Annex 1).</p>	60 min
2 <sup>nd</sup> lesson	Students are divided in two groups. The teacher will provoke a debate with the supporters of the conventional cultivation with chemical fertilizers on the one side, and the supporters of the organic cultivation using organic fertilizers on the other side. Both teams will have to find arguments to support their points of view.	60 min
First Out-of-School Visit	An outdoor activity will take place. The teacher organizes a visit to a farm with the organic cultivation near the school where the farmers will show the students how to make the plants thrive.	120 min
3 <sup>rd</sup> lesson	Students will be given a case study for the management of the organic waste products of an oil mill to study at home. The study case is part of the Annex II with all the details, resources, and questions.	45 min
Second Out-of-School Visit	The second outdoor activity includes the visit to the oil mill which is located near the school. The employees of the mill will explain to the students how the waste product management works.	120 min
5 <sup>th</sup> lesson	Students will set a bucket in the suitable place of the school garden and start filling it with the proper materials including organic and food waste.	90 min

## Assessment

### *What are the main types of assessment used?*

**Summative assessment** focused on the outcome will be used, including a quiz (See Annex 3) which will be given to students consisting of the specific questions about conventional and organic fertilizers and their effect on the environment.

**Project based assessment** will be performed as follows:

- The first part of the evaluation will consist of the brochures and posters that students will make in order to motivate their classmates to participate in composting together with uploading their work on the school blog for environmental issues. <https://blogs.sch.gr/onbantou/2019/04/01/how-to-compost-in-our-garden-pictures/>
- The second part of the evaluation will be a [padlet](#) with the topic:

**“Your City's Municipality is going to set up the compost bins in the neighbourhoods. Describe in several sentences how would you motivate your neighbours to participate in the recycling of biomass produced by households”.**

## Annexes

### Annex 1:

#### QUESTIONNAIRE

- 1) What is the purpose of fertilizers?
- 2) What are the ways to make a fertilizer?
- 3) How are the organic fertilizers made?
- 4) How are the chemical fertilizers made?
- 5) Are there any liquid or solid forms of fertilizers in the market?
- 6) What type of the fertilizer is used in the agricultural production and in what form?
- 7) During the use of fertilizers in the crops, do the farmers follow the instructions given to them in order to use them properly or not?
- 8) Are there any laws regarding the import of fertilizers in the market?
- 9) Is there a difference in the cost of production between the use of chemical and organic fertilizers?
- 10) What are the advantages of using chemical fertilizers in agriculture?
- 11) What are the disadvantages of using chemical fertilizers in agriculture?
- 12) What kind of environmental problems do chemical fertilizers cause?
- 13) How can we decrease the use of chemical fertilizers after the appearance of eutrophication?
- 14) What kind of changes does the phenomenon of eutrophication causes in the ecosystem?
- 15) What is biomass and how is it used to produce energy?
- 16) What is the process of composting?
- 17) How can we influence the farmers when it comes to the use of chemical fertilizers in the plants?
- 18) Is composting a solution?

## Annex 2:

### CASE STUDY

#### BIOECONOMY CASE STUDY FOR THE USE OF OLIVE OIL WASTES

WASTE MANAGEMENT in the olive oil factories is well known as a major environmental issue for our region. Following the links below you can find information concerning this problem. Before you continue make sure that you can answer these questions:

- a) How does the production process of the olive oil in the factory work?
- b) What are the methods in the production of the olive oil?
- c) Is the waste created during the production of the olive oil and if yes, in what form?
- d) What is the relationship between the production of the olive oil and the negative results for the environment?
- e) Should toxic waste be dealt with the terms of bioeconomy or not?
- f) How important is the composting of organic waste for the production of fertilizers?

#### **Sources of information:**

##### **Websites:**

[http://www.prosodol.gr/sites/prosodol.gr/files/DGr\\_6.pdf](http://www.prosodol.gr/sites/prosodol.gr/files/DGr_6.pdf) (page 31)

[http://www.olivepellet.gr/?p=p\\_8](http://www.olivepellet.gr/?p=p_8)

<http://www.agroenergy.gr> (recycling organic waste paragraph)

<https://www.ypaithros.gr/nea-proseggisi-adeiodotisi-elaiotriveio-prooptikes/>

<http://www.cheesenet.gr/odippaf/ParousiasiPatra.pdf>

##### **Videos:**

<https://www.youtube.com/watch?v=nAKqovSB7bM>

<https://www.youtube.com/watch?v=2fgk1PZTKJs>

<https://www.youtube.com/watch?v=EiEGsm3L9kk>

<https://www.youtube.com/watch?v=R7cLofL72Nc>

<https://www.youtube.com/watch?v=hIm-Kxx6IqI>

[https://www.youtube.com/watch?v=QD36k1\\_Ovs](https://www.youtube.com/watch?v=QD36k1_Ovs)

We have now reached the four stages to think about:

#### **1) Stage concerning the Diagnosis: What is the core problem?**

Identify where does the production process of the olive oil causing problems and how is this problem related to the production unit and the environment.

#### **2) Stage of Intervention and Planning: What should be done?**

Refer specifically to the changes that should be made in the oil production process in order to solve the problem they are facing. Try to enlist the changes in hierarchical order starting with the most important one.

#### **3) Stage of Implementation: What kind of measures or mechanisms we should use?**

Set out specific measures or mechanisms that the mill management of the olive oil factory will have to adopt to in order to solve the problems.

**4) Evaluations.**

Visit the olive oil press factory area to find out what kind of measures are being taken in order to use the biomass for the environment protection.



**Annex 3:****QUIZ**

Answer the following questions:

- 1) In order to keep the plants healthy do we need anything other than just soil, water and fertilizer:  
 Yes  
 No
  
- 2) Fertilizer is a substance created by either natural resources or manufactured in order help the progress in plant development:  
 Yes  
 No
  
- 3) Fertilizers which come from decomposed materials such as manure, compost, or which are made from seaweed are called:  
 Organic  
 Chemical
  
- 4) Fertilizers which come from minerals that have been synthesized through chemical procedures are called:  
 Organic  
 Chemical
  
- 5) Which of these kinds of fertilizers already exists in the market?  
 Organic  
 Chemical
  
- 6) Which of the fertilizers shown below is used more in the agricultural massive production when it comes to the real conditions?  
 Organic  
 Chemical  
 Organic and chemical
  
- 7) Which of these fertilizers' categories are being used most in the agricultural production?  
 Organic  
 Chemical  
 Organic and chemical
  
- 8) Which kind of fertilizers shown below is used less in the agricultural production due to economic reasons:  
 Organic  
 Chemical
  
- 9) Out of all the types of fertilizers in the world the ones that cause the most harm in the environment are:  
 Organic  
 Chemical

**10)** The result of overuse of chemical fertilizers in the environment is the phenomenon of eutrophication:

- Yes
- No

**11)** The consequences caused by eutrophication are:

- A.** Increase of plant biomass in the water
- B.** Reduce of the level of transparency in the water cause of the algae
- C.** Lack of oxygen conservation in the water
- D.** Decrease in the species variety
- E.** All the above

**12)** What can we do in order to reduce the pollution and sustain the ecosystem?

- A.** Promote organic agriculture
- B.** Use the fertilizers produced by decomposed materials
- C.** All the above