Report on the activity in the framework of the European Inventor Network

Name of the alumnus who implemented the activity:
Marcin Chodorowski

Short description of the activity
Program: Innovation and Entrepreneurship Laboratory in a school garden.

At the end of September, Marcin Chodorowski invited Ms. Bożena Żukowska - a teacher from Elementary School No. 2 in Łomianki - to the foundation's experimental garden to discuss the timetable for implementing the program, which is funded by EPO. It was agreed that a student team would be formed to be responsible for the work of establishing and maintaining three composters in the school's garden and the KIM Foundation's garden for biomass harvested from the area around the school and the school cafeteria. Composter No. 1, with a capacity of 0.8 m^3, will be run using the traditional method (cold composting process). Composter No. 2 will be called red earthworm-leaf bioreactor (RW&L-small) and its capacity will also be 0.8 m^3. It will be a prototype of an innovative approach to the process of composting difficult-to-decompose material such as oak leaves and needles using red earthworm and green waste from the school cafeteria. Students will ensure that the composition of composted biomass in both composters includes a layer of oak leaves and needles (carbon mantle) and biomass obtained from the school cafeteria (nitrogen core). In addition, students will build a bioreactor (RW&L-large) with a capacity of 4 m^3 in the garden of the KIM Foundation. The walls of the reactor will also be lined with oak leaves and pine needles. This organic material was chosen because oak and pine trees dominate the area of Łomianki. During the autumn-winter period, the city authorities have considerable logistical and financial problems with the disposal of such a large amount of biomass. On this issue, a meeting was held with the owner of a company that takes care of the greenery in Łomianki, who promised to provide an appropriate amount of bioinput to RW&L-large. In this bioreactor there will be as many as three cores with a total capacity of 1.8 m^3 for bio-waste from the school canteen. During a discussion with the canteen manager, it was agreed what kind of bio-waste will be transferred for use in the composting process and for feeding red earthworms. All are bound by national guidelines set by the main sanitary authority. In composter No. 1 and both bioreactors, students will conduct cyclic measurements of temperature and humidity.

The implementation team will also build a box in which a culture of red earthworms will be established. The students will be responsible for systematically monitoring and feeding the cultured earthworms with green waste.

The next step was to arrange a meeting between Professor Wiesław Nowinski, who will conduct a series of workshops on innovation at the school, and the leaders of the implementation team.

As of December 19, there had been 4 field workshops of the implementation team, which now has 15 students. The following work was carried out:

- Preparation of two school composters.

- Composter No. 1 run by the traditional method - cold composting process.
- Bioreactor RE&L-small with a nitrogen core in a cover of oak leaves and pine needles.

- Filling composter No. 1 and RE&L-small with biomass and its colonization with red earthworms with a total weight of 1 kilogram;
- Building a box and filling it with biomass and then colonizing it with red earthworms with a total weight of 2 kilograms. In this way, a place for breeding red earthworms was created.
- Systematic feeding of the cultured earthworms.
- Building a leaf-earthworm bioreactor housing (RE&L-large) from waste materials (according to the zero waste concept).
- Acceptance of 4 m^3 of biomass (oak leaves and needles), part of which was placed in the L&RW-large bioreactor.
- Systematic filling with biomass from the school canteen of successive cores of the bioreactor RW&L-large.
- Analysis of the processes taking place in composter No. 1 (traditional method composters) and both bioreactors RE&L-small and RE&L-large.

Date and place of the activity

- September 27 meeting at the headquarters of the KIM Foundation with Mrs. Bożena Żukowska teacher at elementary school No. 2 in Łomianki. Establishing the principles of cooperation.
- October 17 meeting on the premises of SP no. 2 of Professor Wieslaw Nowinski, who will conduct a series of workshops on innovation as part of the program, with Ms. Aneta Sosinska the school principal, Ms. Bożena Żukowska a biology teacher and seven leaders from the implementation team.
- On October 20, work on the grounds of SP No. 2. The implementation team prepared composter No. 1 and RE&L-small to accept biomass. A box for rearing red earthworms was created.
- November 2 field workshop on the site of SP No. 2. The nitrogen core in RW&L-small was filled with biomass from the canteen. The students received red earthworms, with which they colonized both composters and began raising earthworms in a box previously prepared and filled with biomass.
- On November 10, the field workshop at SP No. 2. The students replenished the biomass in both composters and in the box with earthworms. They protected the composters and the earthworm farm from the effects of cold temperatures.
- On November 30, December 7 and December 14, temperature and humidity measurements were taken in the composter and bioreactors.
- On an ongoing basis, selected bio-waste from the school cafeteria is transported to the cores of the RW&L-large bioreactor. Implementation team.
- On December 21 at the site of SP No. 2 another field workshop with the implementation team is planned.
- Starting in January 2024, a series of workshops promoting the program, the innovation concept and the zero waste philosophy are planned to be held on the premises of SP No. 2. The workshops will be attended by students from ten classes of SP No. 2 in Łomianki. The process of monitoring and "feeding" biomass to the composter, bioreactors and running an earthworm farm will be continued by members of the implementation team.

Audience (number and age of the participants)

The team responsible for the implementation of the innovative zero-waste system in the school garden. The basic composition of 15 people from 11 to 14 years old and a teacher.

Outcomes and achievement

After the first meeting with teachers from SP No. 2, the program schedule changed. Instead of implementing a series of workshops, work began, resulting in the preparation of a system to use three types of readily available biomaterials: peelings, vegetables and fruits from the school cafeteria, oak leaves and pine needles. As a result, a system was developed that reduced the amount of kitchen bio-waste by 50%. Preliminary estimates indicate that the cost of disposing of bio-waste from the school canteen has been reduced from 1,000 pln to 250 pln per month. Of course, the cost reduction is temporary because once the cores in the RW&L-small and RW&L-large bioreactors have been filled, the canteen waste will be used in smaller quantities for rearing red earthworms. Nevertheless, the school canteen should reduce monthly costs by at least 250 pln. Verification of this assumption will be possible in the coming months of next year.

Although the winter in Poland this year is quite mild (a small number of days with freezing temperatures), biochemical processes taking place in the cores of both bioreactors triggered thermal reactions in November-December averaging around 35-40 degrees Celsius. Of course, it remains an open question how we can use this energy on the scale of a school project.

Growing red earthworms. The box in which the students prepared a mixture of peat soil, compost soil, and bio-waste from the school canteen was properly protected from the low temperatures prevailing in winter. With each feeding of earthworms (adding kitchen waste), the students see that the population of these useful biomass eaters is steadily increasing. However, only in the spring will they be able to estimate whether breeding success has been achieved. The average weight of earthworms from the selected place in the box will be compared with the starter, i.e. 2 kilograms of earthworms with which the substrate was colonized.