

Report on the activity in the framework of the European Inventor Network September 2023 - December 2024



To be sent to:

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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 2023, 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 m³, 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 m³. 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 m³ 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 m³ 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 Wiggler Composting Worms. 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 Wiggler Composting Worms will be established. The students will be responsible for systematically monitoring and feeding the cultured Red Wiggler Composting Worms 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 2023, 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 Red Wiggler Composting Worms with a total weight of 1 kilogram;
- Building a box and filling it with biomass and then colonizing it with Red Wiggler Composting Worms with a total weight of 2 kilograms. In this way, a place for breeding Red Wiggler Composting Worms 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 m³ 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 2023

- 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 Wiesław 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 Wiggler Composting Worms 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 Red Wiggler Composting Worms. They protected the

composters and the Red Wiggler Composting Worms farm from the effects of cold temperatures.

- On November 30, December 7, December 14, December 21 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.

Date and place of the activity 2024

- From January to October, members of the implementation team continued the process of monitoring and 'feeding' biomass to the composter, bioreactors and running an Red Wiggler Composting Worms farm.
- From January 2024 was implemented , a series of workshops promoting the program, the innovation concept and the zero waste philosophy on the premises of SP No. 2. One meeting each was held in all grades 1-4, where we explained the innovativeness of our programme to the pupils based on the process ofcomposting green waste from the school canteen.In total, we taught 12 lessons, attended by 270 students.
- Nine workshops were held in class 5, where we discussed the various stages of our innovative project, i.e. the composting process, the cultivation of Red Wiggler Composting Worms and the use of lactic acid bacteria. Students in grades 6-8 took part in two workshops (innovation and the composting process and the use of biohumus in the school garden). A total of 16 meetings were held in which 175 children actively participated.
- A total of 525 students participated in this year's programme under the EPO grant.
- In addition, a group of pupils involved in the school garden carried out composting and earthworm farming, which will be given to the residents of our town this autumn.
- In May, we organised meetings with Professor Wiesław Nowiński, who gave lectures entitled 'Why it is important to be an innovative scientist'. Fifty-four eighth-grade students attended.
- July - August summer holidays - occasional inspection of compost piles and Red Wiggler Composting Worms breeding.
- September/October:
 - distribution of 38 boxes of earthworms. The rest of the Red Wiggler Composting Worms were transferred to a bio-reactor fed with bio-waste from the school canteen.
 - 2,000 litres of humus - a product of the biomass composting process and the work of Red Wiggler Composting Worms - were transported to the beds in the school garden.

Audience (number and age of the participants)

In 2023/2024 a total of 525 students participated in this programme under the EPO grant.

Outcomes and achievement

Ex: qualitative information , such as testimonials or success stories

2023

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.

2024

Summary of results achieved:

- All pupils (525 plus teachers) from primary school number 2 in Łomianki participated in the programme.
- Two bio-reactors were built, in which more than 2,000 litres of humus were obtained from bio waste. 2,000 litres of humus were transported to the beds in the school garden.
- The market price for 1 litre of humus is around 0.60 PLN. This means that by composting the biomass, humus was obtained, the value of which at retail prices was 1,200 PLN.
- By composting bio-waste from the canteen, the school saved about 3,000 PLN in bio-waste disposal costs.
- The programme managed to grow enough the Red Wiggler Composting Worms to fill 38 boxes - starter kits - with them. The boxes were designed and made by pupils as part of our programme. The Red Wiggler Composting Worms were distributed free of charge to the inhabitants of Łomianki. This action was called by the students 'Adopt an earthworm for the composter'. The market value of one set is 70 PLN. The potential financial income is PLN 2,660. More than half of the Red Wiggler Composting Worms raised were transferred to

bio-reactors where they will decompose biomass from the school canteen over the next year.

- The school received a set of gardening tools and a rainwater tank.
- Thanks to a grant from the EPO, a guidebook 'Gardening in harmony with nature' has been produced. The content also includes information on earthworm farming.
- The school management and the school canteen manager are interested in continuing the programme of a composting process for some of the bio waste from the school canteen.
- Our programme activities have been very much appreciated by teachers and the local community in our town.
- We have received enquiries from two local primary schools about the possibility of implementing our programme on their premises in 2025.

Recommendations

When implementing a similar project, several factors need to be taken into account to ensure that the programme achieves its objectives. These are:

- **Possibility of close cooperation and consultation with Professor Wiesław Nowiński**
- **Motivated school management and teaching staff to actively support the implementation of the project.**
- **Support from the canteen manager and staff.**
- **Support from the local authority that owns the primary school.**

*Ex: any recommendation for
Future activities based on the
Experience and outcomes of
This grant-funded activity*

Photos of the programme process and the 'Gardening in harmony with nature' guide were sent to Marjorie Chopinaud and are attached below. We have permission to publish this material on the European Inventor Network webpage.



Adoptuj dżdżownicę



W ramach projektu realizowanego przez Szkołę Podstawową nr 2 w Łomiankach oraz Fundację KIM rozdajemy dżdżownice kalifornijskie wspomagające proces kompostowania.

Osoby zainteresowane adopcją dżdżownic prosimy o wysłanie informacji do nauczyciela biologii na librusie.

Dżdżownice zostaną przekazane dziecku.





