

Journal of Agricultural Sciences Research

COMPOSTING AS A TOOL FOR ENVIRONMENTAL EDUCATION

Santina Rodrigues Santana

``Universidade Federal de Rondônia`` –
Fishery Engineering Department, Presidente
Médici, RO.

<https://lattes.cnpq.br/3559414297094574>

Zeani Veloso

Mixed Cooperative for Agribusiness
Development, Primavera do Leste, MT.

<http://lattes.cnpq.br/2115084729086069>

Mikael Antônio Vieira

``Escola Estadual Tancredo de Almeida
Neves Tempo Integral`` , Rolim de Moura,
RO.

<http://lattes.cnpq.br/3057067001283794>

Venicio Favoretti

``Instituto Federal de Educação, Ciência e
Tecnologia do Amazonas`` – Department of
Teaching, Research and Extension, Lábrea,
AM.

<http://lattes.cnpq.br/1841389359157129>

Wanderson Félix da Silva

Faculty of Biomedical Sciences of Cacoal,
Department of Biology, Cacoal, RO.

<http://lattes.cnpq.br/1399636004618705>

Wesclen Nogueira Vilar

``Universidade Federal de Rondônia`` –
Fishery Engineering Department, Presidente
Médici, RO.

<http://lattes.cnpq.br/3936499839413520>

All content in this magazine is
licensed under a Creative Com-
mons Attribution License. Attri-
bution-Non-Commercial-Non-
Derivatives 4.0 International (CC
BY-NC-ND 4.0).



Abstract: The generation of organic waste in a reality. This way, it is important to find efficient management ways for an adequate destination of this waste. Recycling through the composting method is presented as a viable alternative to meet the high volume of organic waste produced. In addition, composting is established as an essential tool to develop the Environmental Education theme. In this context, this study aimed to sensitize public school students through composting practices as an Environmental Education instrument to develop preservation attitudes and environmental awareness of the environment around them. A total of 14 public schools were contemplated, with exposure of lectures and practice related to the theme. The students were very receptive, interested and committed, from choosing the location for the composter to be set up, assembling the windrows, monitoring the composter together with school employees, to the final production of the organic fertilizer that was later used in the vegetable garden. of institutions. With the development of EE activities, students were able to increase their environmental awareness in relation to environmental issues.

Keywords: Apprenticeship; Public school; Rondônia; Sustainability.

INTRODUCTION

Waste production has increased significantly in recent decades (KIBLER et al., 2018; BONG et al., 2018). According to data from the National Sanitation Information System (SNIS), urban public waste (UPR), including organic household solids (RDO), is produced at an average of 0.99 kg/inhabitant/day. Of the waste that goes to final disposal, 14.6% is disposed of in sanitary landfills, 13.6% in controlled landfills, 26.1% in dumps, 27.3% goes to sorting units, 1.6% represents recyclables dry and 1.71% are composted,

15.6% have no information (SNIS, 2019). The accumulation of organic waste without proper destination can generate serious problems, such as the proliferation of insects (e.g. cockroaches, fleas and disease-causing mosquitoes) and the possible spread of diseases in urban centers (KAVYANIFAR et al., 2019).

This way, the recycling of organic waste is presented as a viable alternative to meet this demand. Among the recycling methods, composting stands out, contributing significantly to maintaining a clean and healthy environment, free of disease and pollution. In addition to these benefits, composting is established as an essential tool to develop the Environmental Education (EA) theme (BUSS; MORETO, 2019). EA can be worked through composting, as the aspects observed in the process are established as a playful method to develop ethical awareness about the correct use of natural resources. In addition, it can be addressed in all spheres of society, including education (GUIMARÃES et al., 2009; SÁ; OLIVEIRA; NOVAES, 2015). According to Semulsp (2015), waste recycling workshops, worked in EA, have been increasingly studied given their importance in environmental issues and because they have processes that can serve as a basis for the preservation and construction of a clean environment. and healthy for society.

The development of activities of this nature in the school environment provides adequate treatment of the organic waste generated by the institutions. It presents itself as a playful way to contextualize the cycle of organic matter, improving teaching in science, biology and chemistry classes where the EE theme is addressed. In addition, it promotes environmental awareness, not only among students, but throughout the school community involved (BUSS; MORETO, 2019; PAIVA et al., 2020).

EA in the school environment is recognized in official documents. In Brazil, Law nº 9.795/99 stands out, which provides for the National Policy on Environmental Education and determines that EE must be worked on at all levels and modalities of the educational process (BRASIL, 1999). Cuba (2010) emphasizes that it is necessary to carry out environmental education work, inside and outside the school, including environmental awareness projects, reuse and recycling, involving students and teachers in the classroom, making them multipliers of sustainable attitudes, from environmental point of view.

In this context, this study aimed to sensitize public school students through composting practices as an Environmental Education instrument to develop preservation attitudes and environmental awareness of the environment around them.

MATERIAL AND METHODS

The present study was carried out in the southern region of the state of Rondônia, northern Brazil, with students from public primary and secondary schools, in urban and rural areas, in the cities of Cacoal, Espigão do Oeste and Pimenta Bueno.

University extension actions, through the Composting Extension Project in schools, were developed from June 2007 to June 2008, with the collaboration of 10 extension students from the Biological Sciences Course at the Faculty of Biomedical Sciences of Cacoal (FACIMED), biology, science and chemistry teachers from the schools that joined the proposal, helping with lectures and workshops on composting.

The methodological procedures for carrying out the actions were divided into six stages, namely:

First Stage: definition with the management of the schools and with the

teachers about the activities carried out;

Second Stage: preparation of lectures and training for academics on composting workshops;

Third Stage: Lectures held in schools with elementary and high school students;

Fourth Stage: collection of organic waste (for one week);

Fifth Stage: assembly of the compost bin;

Fifth Stage: monitoring of the composter. This stage lasted six months, for complete decomposition of the residues and obtaining the organic compost.

The waste collected for composting came from the kitchen during the students' lunch hours and through donations from community residents. The selected composter was the homemade type of windrows (Figure 1), due to its low cost, measuring 100 cm wide, 150 cm long and 100 cm high (OLIVEIRA; AQUINO; CASTRO NETO, 2005).

The composition of the windrows was formed by layers of 20 cm of organic waste (for example: leftover vegetables, leftovers from lunch, coffee grounds, fruit and vegetable peelings) (Figure 1), and interspersed with dry leaves, gardening pruning, wood sawdust and dry cattle manure, to increase the nitrogen concentration, as recommended by Oliveira, Aquino and Castro Neto (2005). Plant material, such as garden pruning, grass clippings, palm leaves and sugarcane bagasse, are rich in carbon but poor in nitrogen, so it is necessary to add this plant material, because without this balance there is no the production of the expected organic compound.

RESULTS AND DISCUSSION

The project included 14 public schools, nine of them in the municipality of Cacoal (Escola Graciliano Ramos, Bernardo Guimarães, Aurélio Buarque de Olanda,



Figure 1. Assembling the windrow composter. First layer made up of palm leaves, grasses, dry leaves and dry cattle manure, interspersed with leftover vegetables, leftover snacks, coffee grounds and fruit peels.



Figure 2. a = lectures with high school students; b and c = setting up the windrows; d = adding cattle manure.



Figure 3. a = school employee turning over the compost; b = sifting of compost by students; c = ready organic fertilizer.

Josino Brito, Frei Caneca, Paulo Freire, José Mauro de Vasconcelos, Santos Drumond, and assistance to the ``Pastoral da Criança``), four in Espigão do Oeste (Fernanda Souza de Paula School, Jean Piaget, Jerris Adriani Turatti and Vinicius de Moraes), one in Pimenta Bueno (Marechal Cordeiro de Farias School). In total, 783 students were contemplated, with exhibition of lectures and assembly of a compost bin in each school.

Extension academics started extension actions by discussing composting with students. In this subject, all phases for the construction of a compost bin and how the composting process is carried out was contemplated. Topics such as solid and organic waste, correct disposal of waste, recycling, materials that can be composted and those that cannot be composted, soil micro-organisms (e.g. fungi and decomposing bacteria), benefits of organic fertilization, use of organic compost in vegetables, medicinal plants, gardening, sustainability, among others.

It was found that the pile composter used in schools was efficient, facilitating management throughout the decomposition process of organic waste during the six months of development of the study. Albuquerque et al. (2020), who implemented a compost bin in a school in northwest Paraná, also adopted the pile compost bin, the authors found that, despite the low-cost advantage, problems arose related to attracting animals such as scorpions, monkeys and skunks, a fact not verified during the development of this study in the contemplated schools.

In all schools it was observed that the students were receptive, interested and committed to the lectures given (figure 2 a), the choice of location for the implementation of the compost, the choice of the compost to be implemented, the collection of organic waste, the assembly of the windrows (Figure 2 b, c,

d), the monitoring of the compost along with the Biology teacher and the school staff, until the final production of the organic fertilizer (Figure 3).

After six months of monitoring the compost bin, quality organic fertilizer was obtained to be used in the school garden and garden (Figure 3 b, c).

Silva (2019) tells that, with the participation of children from the 4th to 6th years of the ``Escola Professora Libânia Medeiros`` in Natal (NR), they built a composting pile and obtained organic fertilizer to be applied in the school garden. Araújo et al. (2018) developed the practice of composting with students from the Fauze Scaff Gatass Filho school (Campo Grande, MS) and observed great interest and commitment during the activities carried out. The same was noticed by Oliveira (2014) in a public school in Sarandi, RS, with the compost project, the author reported that students showed great interest in the subject, in the construction of the compost and greater participation in classes. What was also verified during the development of this study, where the students showed great interest, mainly in the disciplines of science, biology and chemistry.

It is noteworthy that currently, composting projects as an EE tool have been intensified in schools in various regions of Brazil, with the aim of enabling the correct practice of recycling organic waste, reducing impacts on the environment, correct disposal of waste and environmental awareness. At ``Escola Estadual Frei Egídio Parisi`` in Uberlândia-MG, Medeiros (2018) obtained support from the students of the 8th grade of Elementary School, in the development of the composting project with leftovers from school meals and earthworms in plastic containers. Mello Filho (2014) coordinated the Vida Água project, where he applied composting and vermicomposting models, with elementary

school classes in two municipal schools in Pinhais (PR). 805 students and 49 teachers participated in the actions. The composting project became an example of actions to be developed in schools.

Souza et al. (2014) built, together with students from two elementary schools, in Cruz das Almas (BA), two compost bins with the purpose of awakening in students the care regarding waste and the importance of finding creative and viable alternatives, which at least, mitigate environmental impacts. Marques et al. (2017), built an artisanal compost bin with low-cost materials and little space demand with 6th grade students at ``Colégio Estadual Júlia Wanderley`` in Curitiba`` (PR).

Lima and Santos (2019) applied the composting technique to 6th grade students at a school in Manaus (AM) with the aim of reusing organic solid waste generated in the school kitchen and leaves that fall from trees to obtain organic compost to be used in the non-conventional food plant garden (PANCs) at the school.

Work with experiments using organic compost was carried out by Sampaio and Oliveira (2005) in São Francisco (BA). After producing organic fertilizer of *E. densa*, a

species of aquatic macrophyte known as Elodea, it was used for corn production. The authors found greater grain production in treatments using fertilizer. In addition, they highlighted that the mass rapidly decomposes, releasing and incorporating nutrients into the soil.

According to Ferrato Junior (2007), for people to change their habits in relation to the environment, it is essential to have environmental awareness. However, for this it is necessary to involve the whole community in teamwork, to acquire new ethical values and thus deal with the difficulties related to environmental issues.

FINAL CONSIDERATIONS

The development of the project provided interaction between Biological Sciences students and public-school students. The practice of composting in schools as an EE instrument has contributed to increasing environmental awareness and building scientific knowledge of both academics and students, facing environmental issues, mainly on the reduction of organic waste, soil quality, plant nutrition, and healthier foods with organic vegetable fertilization.

REFERENCES

- ALBUQUERQUE, R. H. C.; GASQUES, A. C. F.; GASQUES, E. G. F.; SIMÕES, A. L. G.; OKAWA, C. M. P. Implantação de uma composteira em um colégio no noroeste do Paraná. *In: 3º Congresso Sul-Americano de Resíduos Sólidos e Sustentabilidade*, 3., 2020, Gramado. **Anais [...]**. Gramado: CONRESOL, 2020.
- ARAÚJO, V. D.; PEREIRA, M. A. S.; KUNIMOTO, F. T.; ZUBCOV, H. T. Compostagem de resíduos orgânicos em escolas. *In: IX Seminário regional de Extensão Universitária de Região Centro Oeste*, 9., 2018, Rio Verde. **Anais [...]**. Rio Verde: UFG, 2018.
- BONG, C. P. C.; LIM, L. Y.; LEE, C. T.; KLEMEŠ, J. J.; HO, C. S.; HO, W. S. The characterisation and treatment of food waste for improvement of biogas production during anaerobic digestion – a review. **Journal of Cleaner Production**, v. 172, p. 1545-1558, 2018.
- BUSS, A.; MORETO, C. A prática da compostagem como instrumento no ensino de conteúdos e na Educação Ambiental Crítica. **Revista de Monografias Ambientais**, v. 18, n. 6, p. 02-10, 2019.
- BRASIL. Casa civil. **Lei nº 9.795 de 27 de abril de 1999**. Brasília, DF, 1999.
- CUBA, M. A. Educação ambiental nas escolas. **Revista de Educação, Cultura e Comunicação**, v. 1, n. 2, p.23-31, 2010.

FERRATO JÚNIOR, A. L.; SORRANTINO, M. Coletivos educadores. In: FERRATO JÚNIOR, A. L. (Org.). **Encontros e caminhos: Formação de Educadores Ambientais e Coletivos Educadores**. 2. ed. Brasília, DF: MMA – Brasília, 2007. 352 p. Disponível em: https://edisciplinas.usp.br/pluginfile.php/7553202/mod_resource/content/2/Livro%20-%20Encontros%20e%20Caminhos%201.pdf. Acesso em: 28 jun. 2023.

GUIMARÃES, M.; SOARES, A. M. D.; CARVALHO, N A. O.; BARRETO, M. P. Educadores ambientais nas escolas: as redes como estratégia. **Cadernos do Centro de Estudos Educação e Sociedade**, v. 29, n. 77, p. 49-62, 2009. Disponível em: <https://www.scielo.br/j/ccedes/a/WB8qznYGTNS6QDhzcmmWKhk/?format=pdf&lang=pt>. Acesso em: 23 jun. 2023.

KAVYANIFAR, B.; TAVAKOLI, B.; TORKAMAN, J.; MOHAMMADTAHERI, A. A investigation of the quantity and quality of coastal solid waste- a case study coasts of Noor city. **Journal of Environmental Studies**, v. 14, n. 4, 2019.

KIBLER, K. M.; REINHART, D.; HAWKINS, C.; MOTLAGH, A. M.; WRIGHT, J. Food waste and the food-energy-water nexus: A review of food waste management alternatives. **Waste Management**, v. 74, p. 52-62, 2018.

LIMA, E. B.; OLIVEIRA, G. F. S. Compostagem como ferramenta de educação ambiental em uma escola pública de Manaus-AM. **Revista Científica Multidisciplinar**, v. 4, p. 98-117. Disponível em: <https://www.nucleodoconhecimento.com.br/engenharia-ambiental/compostagem>. Acesso em: 27 jun. 2023.

MEDEIROS, W. L. **Educação ambiental a partir da compostagem escolar: resultados de um projeto de intervenção pedagógica em uma escola pública**. 2018. Dissertação (Mestrado Ensino de Ciências e de Matemática) – Universidade Federal de Uberlândia, Uberlândia, 2018.

MELLO FILHO, N. R. **Aplicação e avaliação de técnicas de agroecologia e compostagem como dinamizadores da educação ambiental nos currículos e espaços escolares**. 2014. Dissertação (Mestrado Ciência e Tecnologia Ambiental) – Universidade Tecnológica Federal do Paraná, Curitiba, 2014.

OLIVEIRA, A. M. G.; AQUINO, A. M.; CASTRO NETO, M. T. **Compostagem caseira de lixo orgânico doméstico**. 1. ed. Cruz das Almas: EMBRAPA, 2005.

OLIVEIRA, F. J. **A utilização e a compostagem como prática de Educação Ambiental**. 2014. Trabalho de Conclusão de Curso (Especialização em Educação Ambiental) - Universidade Federal de Santa Maria, Santa Maria, 2014

PAIVA, M. V. N.; LIMA, P. C. A.; FIGUEIREDO, T. O potencial da compostagem para a sensibilização ambiental e redução dos resíduos orgânicos no ambiente escolar. **Revista Com Censo**, v. 7, n. 2, p. 81-89, 2020.

SAMPAIO, E. V. S. B.; OLIVEIRA, N. M. B. Aproveitamento da macrófita aquática *Egeria densa* como adubo orgânico. **Planta Daninha**, v. 23, n. 2, p. 169-174, 2005. Disponível em: <https://www.scielo.br/j/pd/a/tT4dZnRN5dxKJZHVsnqQMCh/?format=pdf&lang=pt>. Acesso em: 29 jun. 2023.

SÁ, M. A.; OLIVEIRA, M. A.; NOVAES, A. S. R. Educação ambiental nas escolas estaduais de Floresta (PE). **Revista Brasileira de Educação Ambiental**, v. 10, n. 1, p. 118-126, 2015. Disponível em: <https://periodicos.unifesp.br/index.php/revbea/article/view/1871/1273>. Acesso em: 28 jun. 2023.

SILVA, K. K. B. **Implementação de projeto integrado de compostagem e educação ambiental em uma escola na cidade de Natal-RN**. 2019. Trabalho de Conclusão de Curso (bacharelado em Engenharia Civil) – Universidade Federal do Rio Grande do Norte, Natal, 2019.

SOUZA, G. S. *et.al.* Educação ambiental como ferramenta para o manejo de resíduos sólidos no cotidiano escolar. **Revista Brasileira de Educação Ambiental**, v. 8, n. 2, p. 118-130, 2014. Disponível em: <https://periodicos.unifesp.br/index.php/revbea/article/view/1792/1220>. Acesso em: 29 jun. 2023.

SNIS - Sistema Nacional de Informações sobre Saneamento. **Manejo de Resíduos Sólidos**. 1. ed. Brasília: Ministério do Desenvolvimento Regional, 2019.