

# Circular Bioeconomy - Potential Recovery by the Municipalities of the Compost Produced from Biowaste

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## ABSTRACT

To study the feasibility of compost recovery that is produced from biowaste selectively collected in the 19 municipalities the Association of Municipalities of the Planalto Beirão Region (AMRBP), a survey was prepared and distributed to the respective municipal services. In the survey, 6 questions were proposed that aimed to evaluate, in each municipality, the areas affected by municipal green spaces managed by municipal services and where the use of compost as an organic corrective and as a soil enricher in humic substances was appropriate, the amount of fertilizers purchased annually and their costs. The results allowed to conclude that there is a wide variety of fertilizer use in green areas, although not proportional with the green area managed. It was verified that the type and quantity of the acquired fertilizers, rich in nitrogen and other macronutrients, do not consider the characteristics of the soils, because only 2 municipalities carry out soil analyses. Globally, there was interest in the use of the compost produced by AMRBP from bio-waste collected in the different associated municipalities.

**Keywords:** Biowaste; Compost; Survey; Municipalities

## INTRODUCTION

The Association of Municipalities of the Planalto Beirão Region (AMRBP) is an inter-municipal system, which integrates 19 municipalities of the Central Region of Portugal, which promotes and manages the collection, treatment, and recovery of waste produced in these municipalities. The AMRBP Organic Valorization Center (OVC) manages 130000 tons of municipal waste annually. With the new targets set for waste management, it is expected that by 2023, domestic and non-domestic biowaste produced in the region will be collected separately, which will increase the quality of the compost arising from the correct management of this valuable wastes (Brás *et al.*, 2021). In OVC, composting is used as a process to stabilize, clean and mature the anaerobic digestion product. This treatment involving its aerobic biological degradation produces a compost, rich in humic substances (HS) that should be used as organic soil amendments. The compost contributes to the health and fertility of soils (Senesi *et al.*, 1996) aiding, directly or indirectly, the plant growth. The compost produced from the OVC of AMRBP can be partly sold for use in agriculture, at a price that will depend on its quality and quantity. The aim of this work is to evaluate the possibility of allocating the compost to the municipalities that produce the original biowastes. In this way, the circular bioeconomy is promoted, with the distribution of the compost produced from the biowastes generated by local citizens.

## METHODOLOGY

It was prepared a survey to determine if 19 Municipalities (MC) that are part of the AMPBR are available to acquire the compost produced from the local biowaste. In this survey, 6 questions were proposed to evaluate, in each municipality, the municipal green spaces areas, where it is appropriate to use the compost as organic corrective and soil enricher. It was also intended to evaluate the amount of fertilizers purchased annually and associated costs. The topics studied were: 1-evaluation of municipal gardens and other green spaces soils quality; 2- the area (m<sup>2</sup>) of municipal gardens and other green areas; 3- the amount of fertilizers purchased annually by the municipality; 4- types of fertilizers/additive used in the management of gardens and municipal green areas; 5- the annual costs associated with the fertilizer purchase; 6- the availability of the municipality to acquire the compost prepared from the biowaste selectively collected by AMRBP in the region.

## RESULTS

From the 19 MC surveyed send, only 13 were answered; however, since one of the municipalities uses an external entity for the management of public green spaces, only the 12 MC (coding as A to L) responses were considered. Table 1 describes the survey responses to evaluate the potential use of the compost produced in the AMRBP. A wide variety of fertilizers is applied in green spaces, but their use is not proportional to the green areas reported. It

was also verified that the use of fertilizers is not dependent on soil characteristics, since only in 2 MC soil analyses are performed. The fertilizers used are mostly additives of nitrogen and other macronutrients – phosphorus and potassium, and only in 5 MC are used fertilizers rich in organic matter. The costs presented (data not shown) are quite variable, and there does not seem to be a relationship between the amounts of fertilizers acquired and the related costs. Hence, a deepen analysis must be conducted to acknowledge the reality in each municipality. In the 11 municipalities that indicated the costs associated with the acquisition of fertilizers for application in gardens and public green areas (G does not acquire), a total annual cost of 16 109 € was found.

Table 1: Results of the survey

Municipality Council	Area (m <sup>2</sup> )	Fertilizer Acquired (kg)	Fertilizer Use/area (g/m <sup>2</sup> )	Fertilizer Characteristics
A	13 000	2 955	227.3	Organic fertilizer and Fertilizer with NH <sub>4</sub> NO <sub>3</sub> with limestone and Water-soluble ammoniacal nitrogen, P and K fertilizers
B	21 000	815	38.8	Organic fertilizer, Organic corrective and Water-soluble ammoniacal nitrogen, P and K fertilizers
C	No information	6 000	-	Organic fertilizer, Organic corrective
D	52 000	4 350	83.7	Complex fertilizer NPK
E	50 000	2 540	50.8	Organic corrective, Complex fertilizer NPK and NPK fertilizer with Mg, B and Zn
F	12 125	750	61.9	Complex fertilizer NPK
G	10 000	Not acquired	-	-
H	89 389	2 236	25.0	No information
I	67 062	3 800	56.7	Organic corrective, Nitrogen fertilizer and NPK fertilizer with Mg, B and Zn
J	50 000	1 500	30.0	NPK fertilizer with Mg, B and Zn
K	650 000	1 400	2.2	Complex universal fertilizer with NTK slow release and Fertilizer with NH <sub>4</sub> NO <sub>3</sub> with limestone
L	15 000	550	36.7	NPK fertilizer with Mg, B and Zn

## CONCLUSION

Considering the importance of valuing biowaste collected separately in each municipality, it is important to emphasize the production of quality compost in the AMRBP and promote its distribution, to achieve the principle of circular bioeconomy. Overall, there is the positive feedback of the MC for the use of the compost produced by AMRBP from biowaste collected in the different associated municipalities; however, the amounts of soil fertilizers are well below the compost that will be produced by AMRBP. Adding to this fact, some City Councils indicated a willingness to consider the acquisition and use of the compost after knowing their characteristics. The produced compost should be subject to a dedicated marketing process to be effectively forwarded to other economic activities and enhance an effective Circular Bioeconomy.

## REFERENCES

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