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Assessment of operational and design issues in a municipal solid waste treatment facility in Lebanon with the Project Cycle Management tool

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Abstract

Solid waste management is still an issue, especially in low and middle-income countries. The case of Lebanon is particularly interesting: in the past two decades, many investments have been done by the European Union and other international actors to target this problem, without reaching a satisfying solution, as highlighted by the waste crisis of 2015. Besides the described issue with solid waste management, given its geographical and climatic characteristics, Lebanon is also suffering from land degradation, which makes every effort towards organic waste valorisation extremely important. The present research is focused on the improvement of an existing solid waste treatment plant, providing a method for the identification of problems and the prioritisation of interventions, with special attention to compost production. The field research was performed in 2018 within a development cooperation project funded by the Italian Cooperation Agency (AICS). The Ain Baal Solid Waste Treatment Facility (SWTF) was built in 2009 to serve 63 municipalities within the Governorate of Sour by treating 150 t/d of MSW. The facility is composed of a mechanical treatment area, where the mixed waste is divided into several streams: the organic waste is biologically stabilized, while the non-organic waste is separated manually to extract the recyclables. Since its construction, the facility has never been able to cope with the expected amount of waste and was consequently revamped in 2018. Moreover, the stabilized organic waste did not have the minimum quality characteristics requested to be used as compost, since it originates from mixed MSW. The development cooperation project had the purpose of improving the overall waste management situation, by introducing segregation-at-source and proposing strategies to optimize the SWTF. The purpose of this paper is to explain how these strategies were elaborated by applying the methodology of Project Cycle Management (PCM). The problem tree for Ain Baal SWTF Operation and management was created to highlight cause-effect relationships and share them in an effective way with the key local stakeholders. The identification of problems was carried out during a three months' period of on-site investigation. Five major problems were selected, therefore, a solution tree was created and general objectives were identified: 1) reduction of odours; 2) improvement of the quality of the compost; 3) implementation of a

proper system for leachate treatment; 4) clear description of the operation and management for the SWMF; 5) increase of the market for the output materials. Specific objectives were identified, together with expected results, actions, investment and priority. The application of PCM allowed a clear understanding of cause-effect chains, identifying the source of each problem and not its most evident consequences. As an example, the low quality of compost was addressed in the past through technical expensive interventions, while the main reason was its origin from MSW and not from food waste segregated at the source. This approach allowed the prioritization of interventions and can be fundamental, especially in contexts where the lack of resources poses a limit to possible actions and every effort should be done to avoid pointless investments.

Keywords: organic waste, compost, optimization, waste treatment, low-income countries