

**Assessment of a full-scale anaerobic co-digestion plant:  
A multi-component substrates analysis by using ORWARE**

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## **Abstract**

A sustainable biogas production in the long term requires different feedstock alternatives especially when reduction of the most desirable organic substrate of food waste has been set as a target in Agenda 2030. In Sweden, horse manure (HM) is generated in large quantities, and because of its physical and chemical characteristics, it has the potential to be used as a feedstock for the production of biogas through anaerobic digestion (AD). In order to investigate the challenges that digestion of HM may impose in terms of methane yield and/or digestate quality, the modified ORganic WAstE REsearch (ORWARE) AD-model was applied. The aim was to study how different substrates or combinations of these would influence the AD and to assess methane and digestate from a full-scale solid-state (SS) AD where different feedstocks including HM were co-digested. In that sense, the model enables analyzing the digestion process of multi-component substrates on an element level. The simulation results suggested that the replacement of green waste (GW) by HM with wood chips as bedding material gave the best improvement in terms of energy turnover; the liquid fraction of the digestate from this substrates mixture had the highest concentration in all nutrients analyzed, specifically in total carbon-biological and phosphorus. It was also found that nutrient concentrations in the digestate from the aforementioned scenario would be in line with respect to the restrictions in the Swedish SCPR 120 certification of digestate for spreading, given that the solid/liquid separation should be avoided.

**Keywords:** co-digestion, digestate, full-scale, horse manure, modelling