Beneficial use of dredged material in agricultural land

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Introduction: The interest in beneficial uses of dredged material as an alternative to conventional disposal practices is increasing. The quantity of material that has to be dredged each year is increasing as a consequence of the higher pressure on waterways and adjacent land. Furthermore, since the population is growing near inland and coastal waterways, there is an increase in the cost of dredged material disposal as disposal sites have to be located at greater distances from the dredging sites. Adding to this, environmental regulations restrict land and water disposal of dredged material.
Beneficial use of dredged material based on scientific knowledge can be more practical, cost effective, and environmentally advantageous when integrated with watershed planning processes and regional strategies for managing sediment resources. It is essential to identify the physical, engineering, and chemical characteristics of the dredged material for evaluating the suitability of the material for numerous alternative uses.
In the project Lift up of Lowlands, the beneficial use of dredged material by spreading thin layers of it on the land adjacent to the waterways is explored. Laboratorial scale experiments of ripening of dredged material were performed and both dredged material and resulting soil were analysed in terms of organic matter content, particle size distribution, type of organic matter (using thermo-gravimetric analysis), CO_2 released during ripening, nitrogen, phosphorous and sulphur content and the wet aggregate stability (as a measurement of vulnerability to water erosion). In addition, the undrained shear strength is determined to know the magnitude of the shear stress that the soil can sustain, i.e., the capacity of the soil to support the loads applied to it without causing shear failure. These parameters are considered to be essential when determining the suitability of a soil to sustain a given practice (agriculture, nature development or dike construction, for example).

Methods: Sediments were dredged from 5 different areas in the Netherlands. The 5 types of dredged material correspond to 5 different concentrations of sand, silt, clay and organic matter. The dredged material was dewatered to -100 hPa (field capacity) and then submitted to biochemical ripening. Biochemical ripening was done in closed bottles, at 20ºC and 95% relative humidity, during 4 months.
Carbon dioxide formation during biochemical ripening was determined. Both dredged material and biochemically ripeedsoil were analysed in terms of organic matter content, particle size distribution, type of organic matter (using thermo-gravimetric analysis), nitrogen, phosphorous and sulphur content and wet aggregate stability and undrained shear strength.

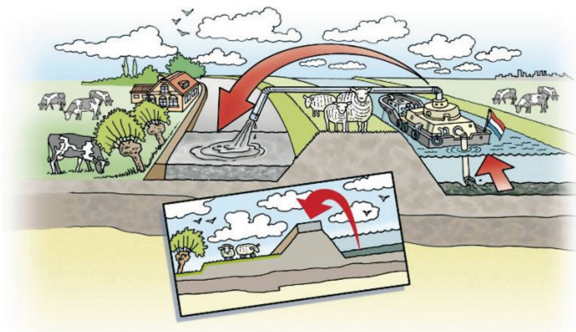

Fig. 1: Schematic representation of spreading dredged material on land

Results: The results indicate a strong correlation between the organic matter and minerals content of the dredged material and the properties of the soil obtained after ripening. This correlation indicates that the composition of the dredged material can be used as a predictor for the ripening-behaviour and final properties of the dredged material. By conducting simple laboratorial experiments, the decision-makers can obtain sustained information about the most suitable destination for a dredged material.