

Soil carbon and nutrient addition from dewatered sediment application to agricultural land – benefits and synergies for dredging and Net Zero

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La Rance Estuary, Brittany, France







Lyvet – Fresh sediment, silty clay



La Hisse – sediment treatment facility Feb 22



La Hisse – dewatered, stored sediment Sept 22



Sediment spreading Sept 22



500m³/ha (= c. 5cm)

(1) La Croix du Frêne - Clay loam onto sandy silt loam



(2) Le Vaugarni - Sandy loam onto sandy silt loam



(1) La Croix du Frêne

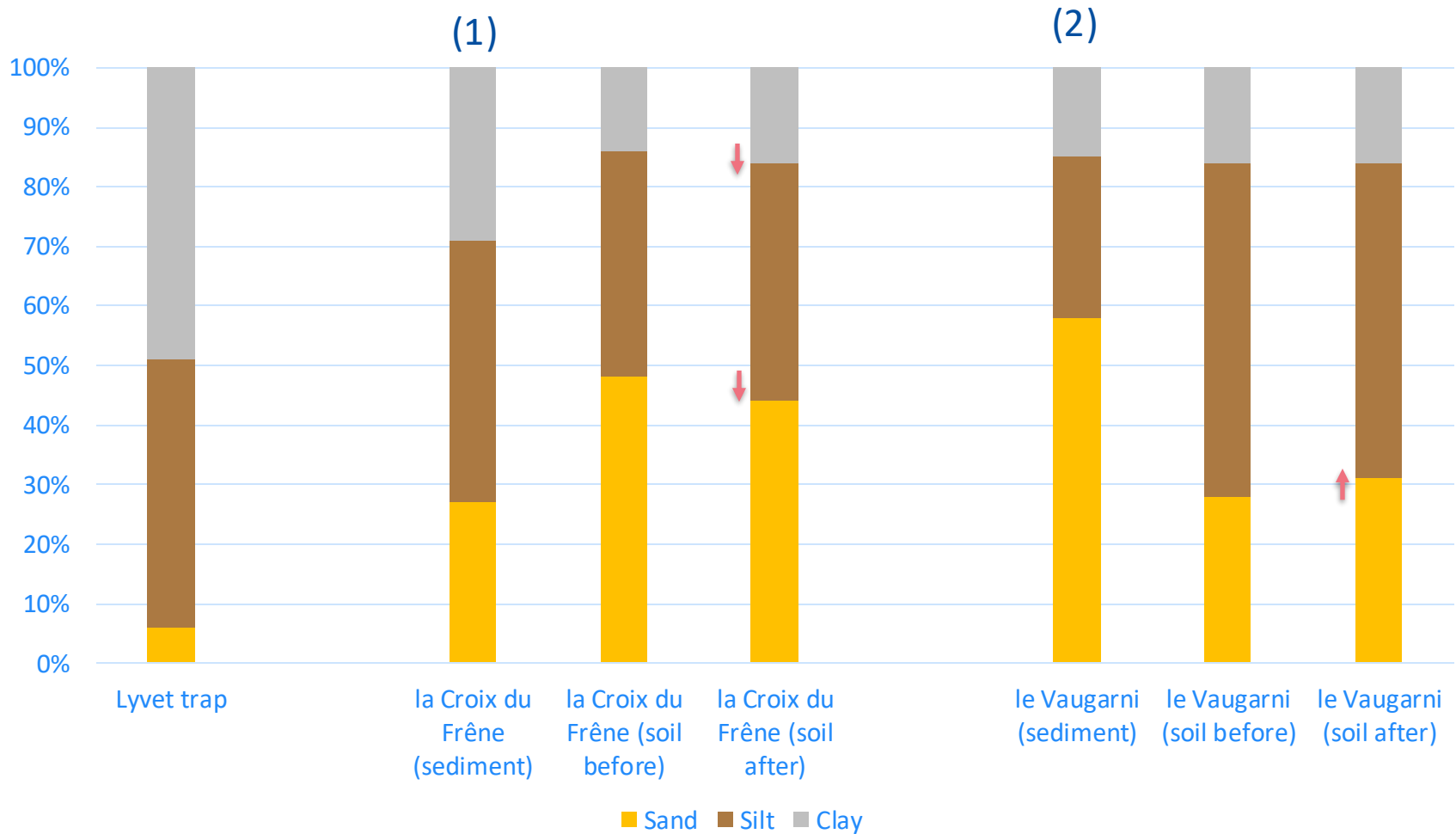
(2) Le Vaugarni



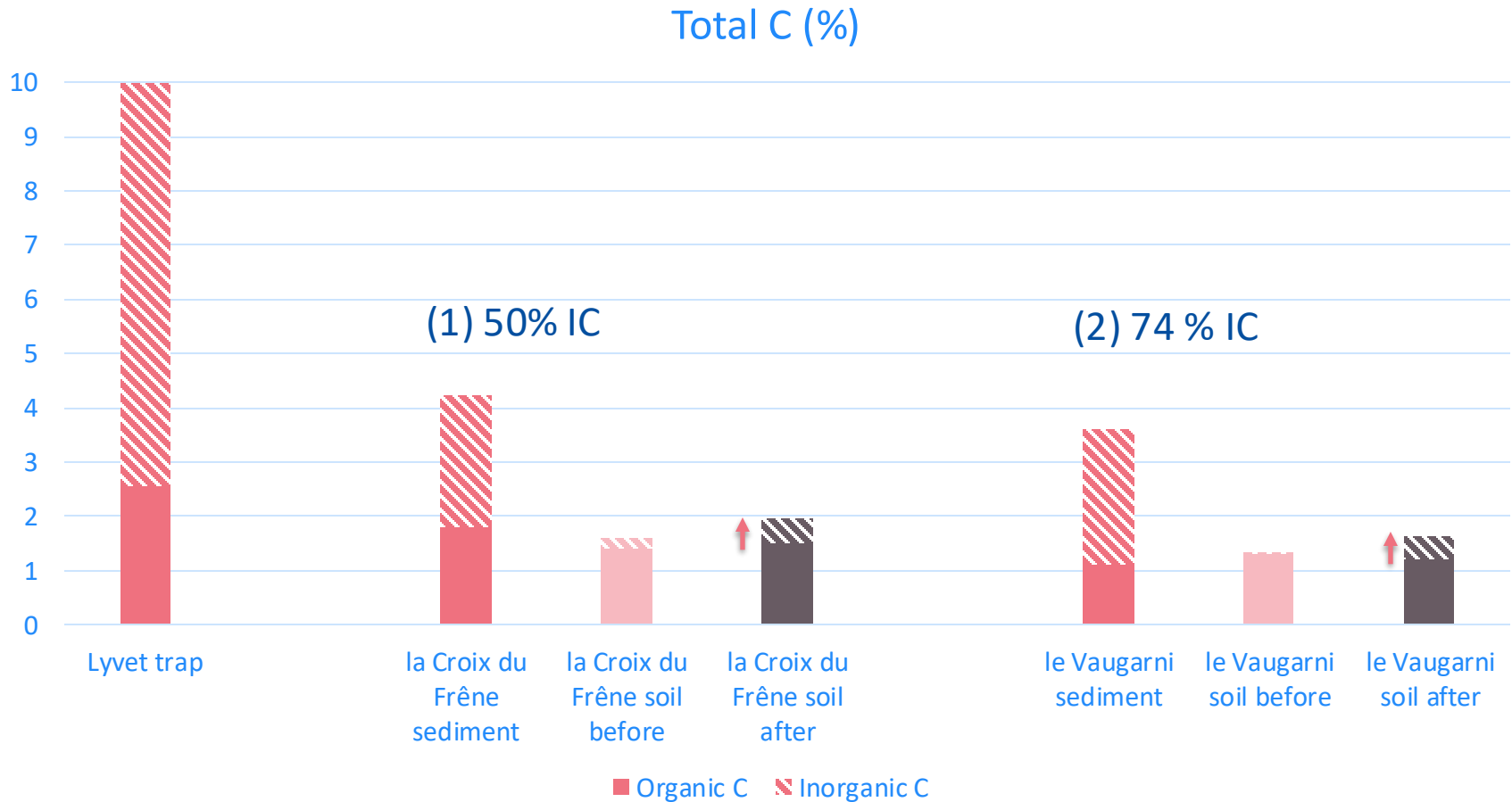
(1) La Croix du Frêne – May 23



Effect of sediment on soil texture (@ 500m³/ha)



Effect of sediment addition on soil total carbon content

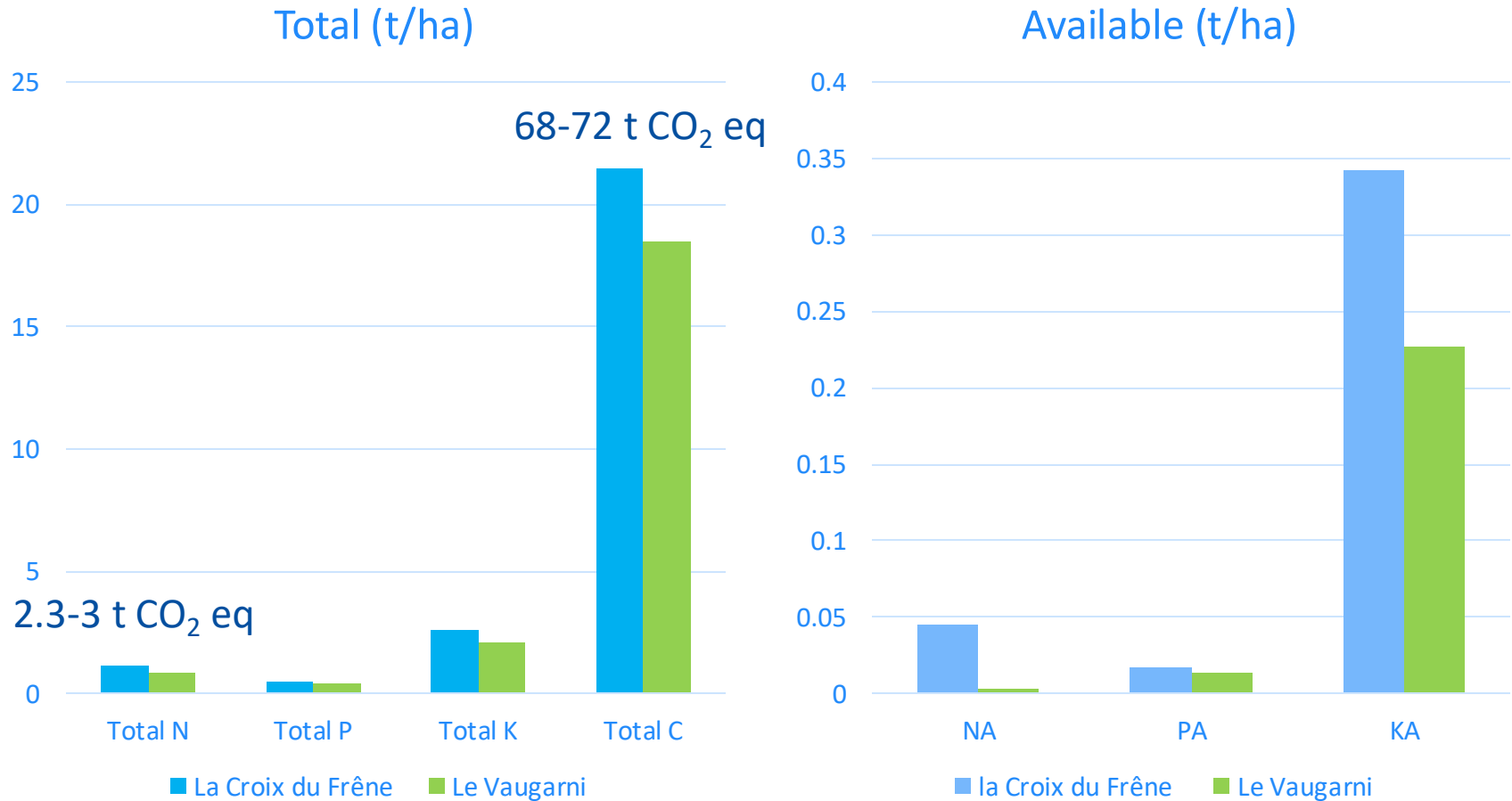


Nutrient/carbon addition - Assumptions

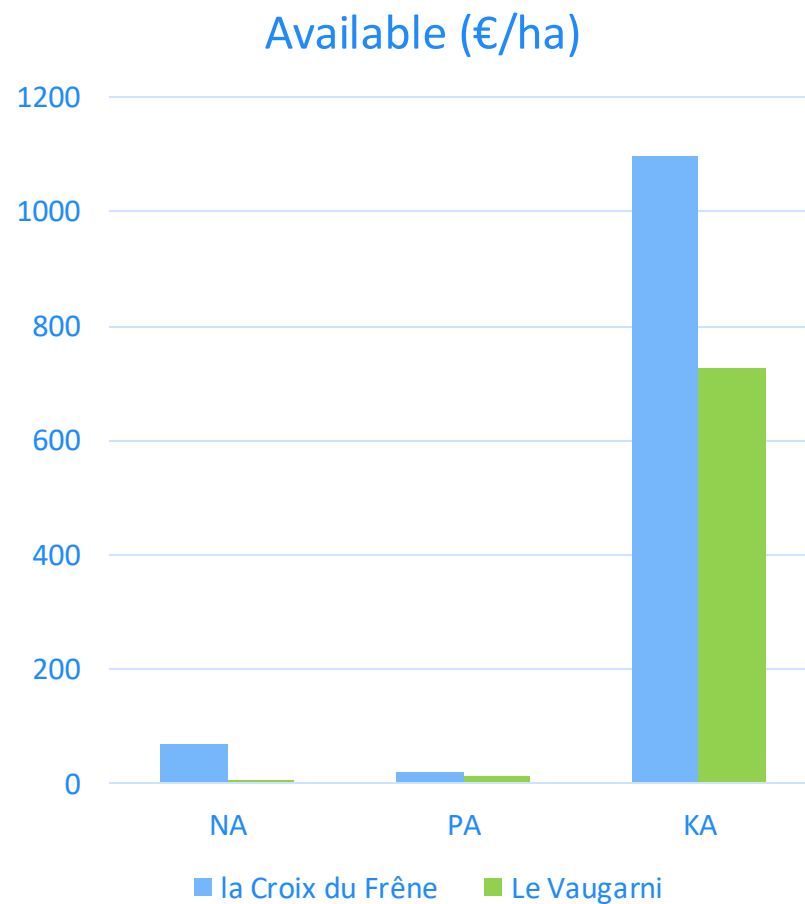
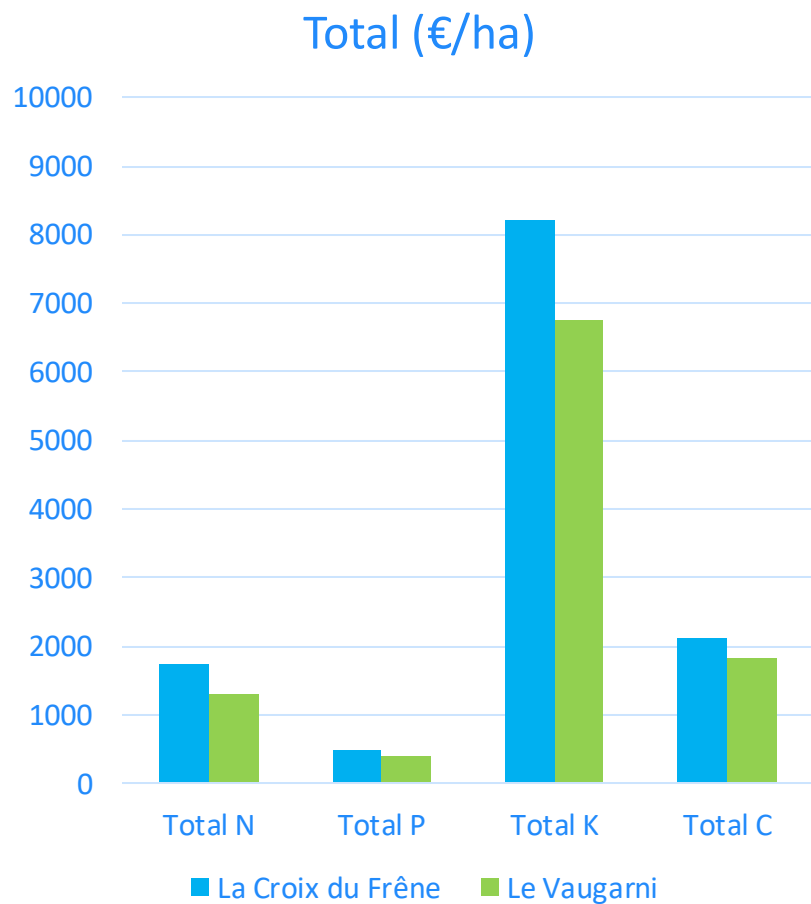
- Application rate 500 m³/ha (as received)
- Density 1.7 t/m³ (850 t/ha as received)
- Dry matter content 60 %
- 510t/ha (equivalent on dry mass basis)
- GB fertilizer prices – April 2023 & 2025

	Ammonium nitrate (UK), t	Muriate of potash, t	Triple super phosphate, t
April 2023	£439	£559	£546
April 2025	£383	£351	£487

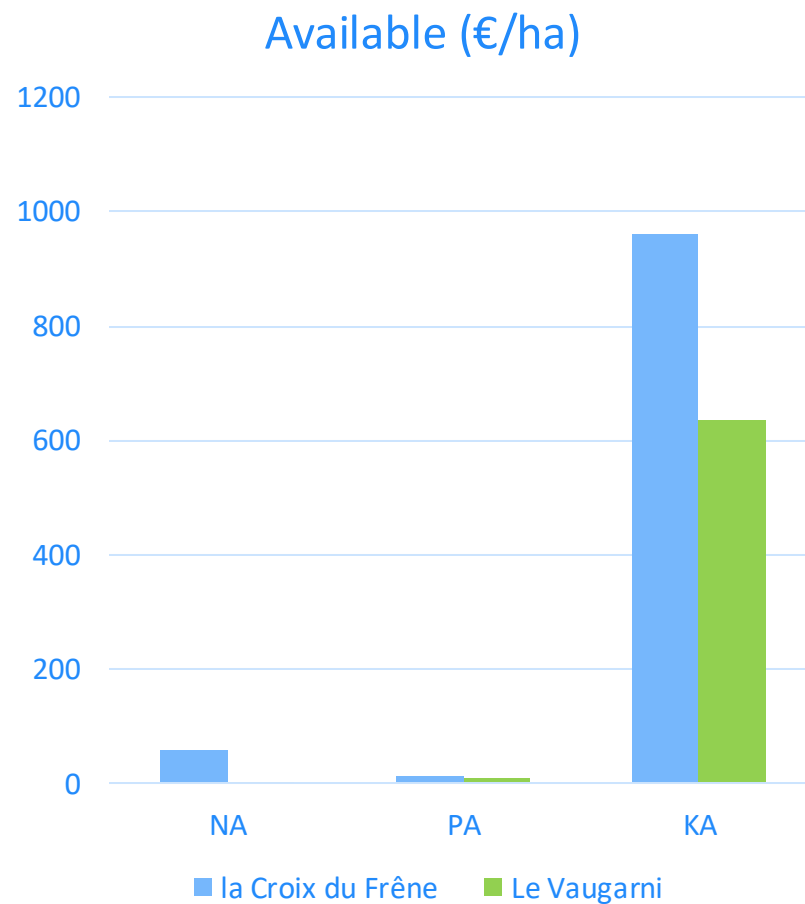
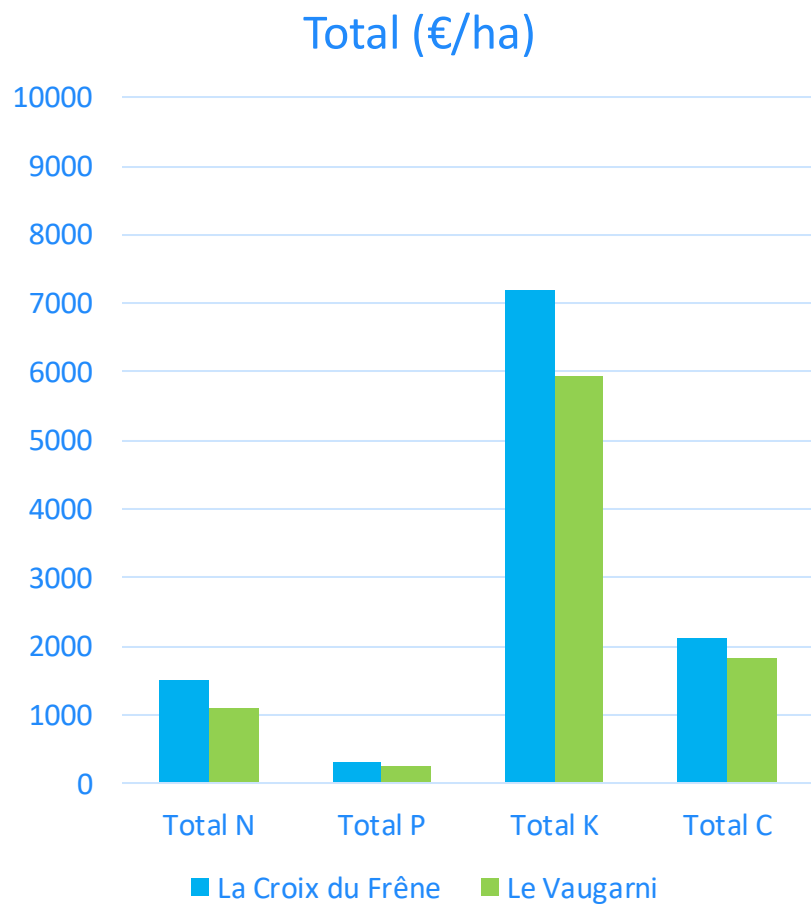
Nutrient/carbon addition by mass (for 500 m³/ha wet sediment)



Nutrient addition by value 2023 (for 500 m³/ha wet sediment)



Nutrient addition by value 2025 (for 500 m³/ha wet sediment)



Conclusions

- Dewatered sediment has a complementary loamy texture to receiving soils (but variable sand)
- Total C addition (19-21t/ha), including organic matter (fertility, 4 per mille?) and carbonate (liming potential)
- Bulk of C addition in sediment is as carbonate (57-75 %), so stored (unless neutralising soil acidity & replacing lime addition)
- Useful addition of nutrients (K>N>P) with the same availability ranking (<14-<4 %)
- Total nutrient value (2023/25) varies from site 1 (€10,439/€8990) to site 2 (€8462/€7288), exceeds spreading costs (€7K/ha), but only 11-9% available
- => Decomposition of OM in soil from cultivation probably releases soil C but also K, N, P nutrients in proportion, with GHG savings for N
- => Loss over time of initial societal benefit of soil C fertility & storage value (€2K/ha), replaced by soil nutrient addition and future fertilizer cost savings between spreading campaigns (10 years)
- => Some additional C storage as carbonate, unless
- => But we need long term monitoring studies to confirm fate of C, K, P & N and true benefits of beneficial use...