ESTIMATING SLURRY NUTRIENT CONTENT

Quick on-site methods

To optimize the use of slurry it is essential to know its nutrient content. This enables sound decisions to be made on fertilization rates, customized to the individual farm situation. Slurry nutrient content is highly variable, not only across farms, but also within a single farm, for example, due to diet or the addition of rainwater, which can vary seasonally. There are financial and environmental benefits to be gained by determining nutrient content of the slurry more accurately, in a quick and easy way, prior to application. A number of approaches are available for rapid analysis on farm. These measurements are facilitated by the use of calculations, specific to regional conditions and/or to the specific type of equipment used.

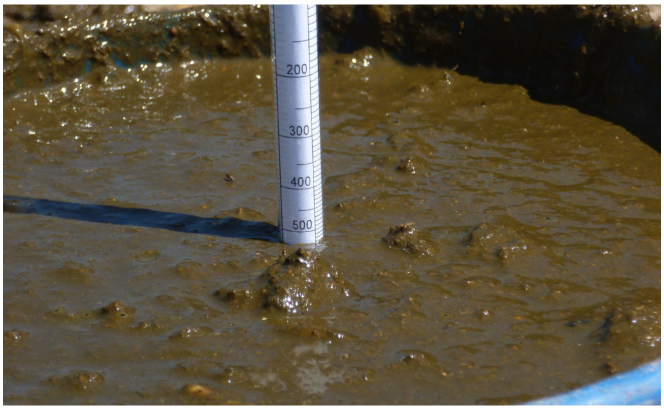
Estimating nutrient content based on dry matter

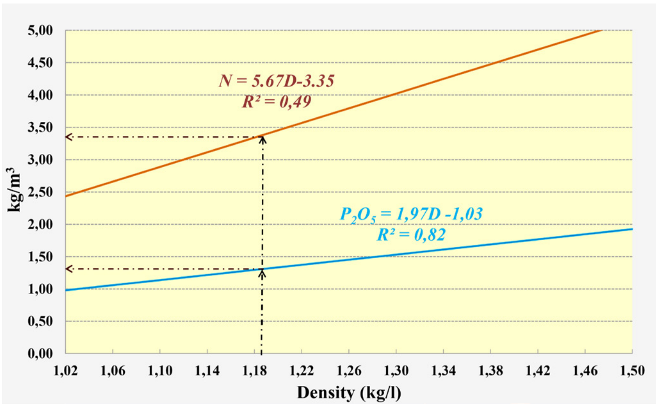
For a given sample, total nutrient content is highly correlated with slurry dry matter content. A simple, easy-to-use method to determine slurry dry matter content and, by proxy, nitrogen (N), phosphorus (P) and potassium (K) content, has been developed by CAFRE in Northern Ireland. The method is based on the differential viscosities of high and low dry matter slurries. When poured on a level surface, low dry matter slurry spreads more widely and irregularly, than higher dry matter material. The measured diameter of a puddle of 500 ml of cattle slurry, when poured onto a concrete floor, has been shown to be highly correlated with dry matter content. Using equations which have been developed in Northern Ireland, the content of N, P and K can be calculated.

More information, and a short, step-by-step video to explain this process can be found here: www.cafre.ac.uk/industry-support/knowledge-transfer/project/slurry-management/

Estimating slurry composition based on density

For density measurements, a hydrometer is required, costing about €12. A representative sample of slurry should be taken from the pit, or from the slurry tanker, transferred to a measuring cylinder or bucket, and stirred. A hydrometer is inserted, and the density (kg/l) is measured after 5 minutes settling time. Nutrient content can then be estimated using a set of calculations specific to the equipment used.





Source: García et al., 2014, 18th Nitrogen Workshop

Estimating slurry composition based on conductivity

To measure conductivity, a pocket conductimeter (costing €100-€125), or a portable laboratory conductimeter (cost approx. €750, and therefore more suitable for advisors), may be used. A representative sample of slurry should be taken, and diluted 1:10 by volume, with distilled water in a measuring cylinder. The electrical conductivity (expressed as millisiemens per centimetre (mS/cm)) is measured with a conductimeter directly from the diluted slurry. A portable or pocket conductimeter with automatic temperature compensation is recommended. It should cover the measurement range 0- 3000 µS/cm and should be equipped with a titanium electrode suitable for dirty and viscous samples, or made of a material resistant to the corrosive agents of the slurry (e.g. graphite).

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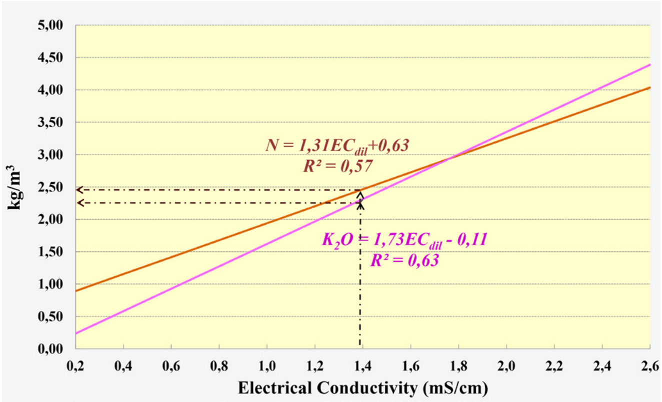

Source: García et al., 2014, 18th Nitrogen Workshop

Combining conductivity and density measurements

The most accurate estimation of the nutrient composition is achieved through a combination of conductivity and density measurements. This significantly improves the estimation of the content of N, P and K when compared to a single measurement.

kg N / m³		Density (kg/l)									
		1,02	1,06	1,10	1,14	1,18	1,22	1,26	1,34	1,42	1,50
EC_{dil} (1:10) (mS/cm)	0,2	1,03	1,19	1,36	1,52	1,69	1,85	2,02	2,35	2,68	3,01
	0,4	1,23	1,40	1,56	1,73	1,89	2,06	2,22	2,55	2,88	3,21
	0,6	1,44	1,61	1,77	1,93	2,10	2,26	2,43	2,76	3,09	3,42
	0,8	1,65	1,81	1,98	2,14	2,31	2,47	2,64	2,96	3,29	3,62
	1,0	1,85	2,02	2,18	2,35	2,51	2,68	2,84	3,17	3,50	3,83
	1,2	2,06	2,22	2,39	2,55	2,72	2,88	3,05	3,38	3,71	4,04
	1,4	2,26	2,43	2,59	2,76	2,92	3,09	3,25	3,58	3,91	4,24
	1,8	2,68	2,84	3,01	3,17	3,34	3,50	3,67	3,99	4,32	4,65
	2,2	3,09	3,25	3,42	3,58	3,75	3,91	4,08	4,41	4,74	5,07
	2,6	3,50	3,67	3,83	3,99	4,16	4,32	4,49	4,82	5,15	5,48

Source: García et al., 2015, Afriga 115

An example of calculations developed for Galician slurries can be found here.

FARMER CASE

Luis Uzal (Escariz Cebreiro Farm) lives in Frades (Galicia). He milks 105 cows, and cultivates 70 hectares of forage crops. He has 2 slurry storage pits with a total capacity of 1063 m³. He believes it is very important to use slurry as a resource to improve the economic and environmental performance of his farm: "In this way I apply nutrients of slurry according to crop demand, I improve the yield and I reduce costs in cattle feed and mineral fertilizers".
The use of quick on-site methods allows him to estimate nutrients quickly, in real time, without having to wait for the results of a laboratory analysis. He does however have one suggestion for further improvement: "Ideally I would have a sensor set up in the pit or tank, that could instantly give me these quick on-site measurements".

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