Use of Poultry Manure as a Fertiliser for Grassland

Farm Advisory Service

Poultry Manure as a Fertiliser

Poultry manures can be used as a fertiliser for grass and crop production, and provide a valuable source of nutrients that can be used to supplement bagged fertiliser.

Table C in Technical Note TN650 (https://www.fas.scot/publication/technical-note-tn650-optimising-application-bulky-organic-fertilisers/) provides the current information on the nutrient value for a variety of agriculturally produced organic manures, with Table 1 below reproducing the information for poultry manures.

Table 1 – Extract from Table C Typical dry matter and nutrient contents of poultry manures

Manure type	DM	kg/t (solid manures or kg/m^3 (liquids/slurries)					
	(%)	Total N	Readily available N	Total P_2O_5	Total K_2O	Total SO_3	Total MgO
Duck FYM - fresh	25	6.5	1.6	5.5	7.5	2.6	1.2
Duck - FYM - old	25	6.5	1.0	5.5	7.5	2.6	1.2
Layer manure	35	19.0	9.5	14.0	9.5	4.0	2.6
Broiler / Turkey litter	60	30.0	10.5	25.0	18.0	8.0	4.4

It should be noted that poultry manure has, as have all organic manures, a variability in nutrient content; to get the most benefit from poultry manure as a fertiliser, take a representative sample from the manure to be applied and have it analysed prior to application

Unlike bagged fertiliser not all these nutrients are available from organic poultry manures in the year of application and care should be taken to ensure that the benefit from the poultry manures is not over or underestimated. The following sections detail the availability of the main nutrients.

The European Agricultural Fund for Rural Development: Europe investing in rural areas

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Main Nutrients

Nitrogen (N)

This is available in two main forms:

Organic - N which is where the nitrogen is contained in organic forms that break down slowly to become potentially available for crop and grass uptake over a period of months or years; and readily available- N which is potentially available for rapid crop uptake. Poultry manures contain moderate to high levels of readily available -N which can be lost easily if applied at the wrong time of year when there is not a crop need. Generally, around 40% of the readily available -N of the poultry manures is commonly lost via ammonia volatilisation following surface application to land. There will also be losses of nitrogen in the form of nitrate by leaching, therefore depending on when the manure is applied the % of nitrogen available to the crop following application will be between 10 and 50% of the total nitrogen applied depending on time of application and the soil type, time taken to incorporate manure and time of year that the manure was applied.

Phosphate (P2O5)

Around 60% of the phosphate in poultry manure is available to the crop in the year of application with the remainder becoming available to the crop in following years. It is essential that poultry manure is applied correctly as phosphorus can cause eutrophication (nutrient enrichment) of fresh water. The remainder of the phosphate will be added to the soil reserves for future crops

Potash (K2O)

Around 90% of potash is available to the crop in the year of application with the remainder adding to the soil reserves.

Other nutrients

Poultry manure also contains an appreciable amount of Sulphur in the form of Sulphate (SO_3) with 15 to 35% of the total sulphate being applied in the spring being available to the crop in the year of application. There is also an appreciable amount of Magnesium in the form of Magnesium Oxide (MgO) but there is limited information on the availability for the crop following application and it should be viewed as contributing to the maintenance of soil reserves.

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Availability of Nutrients

Table 2 below indicates the total nutrients available at different application rates while Table 3 provides the nutrients available to the crop in the year of application—assuming application is carried out at the optimum time of year.

Table 2 - Total nutrients from Poultry Layers Manure at various application rates

		Poultry Layers Manure - Total Nutrients in Application					
Application Rate		Nitrogen		Phosphate		Potash	
Tonnes/Ha	Tonnes/acre	kg/ha	units/acre	kg/ha	units/acre	kg/ha	units/acre
5	2	**95**	76	**70**	56	**47.5**	38
10	4	**190**	152	**140**	112	**95**	76
12.5	5	**237.5**	190	**175**	140	**118.75**	95
15	6	**285**	228	**210**	168	**142.5**	114

Table 3 - Available nutrients from Poultry Layers Manure at various application rates

		Poultry Layers Manure - Available Nutrients to following crop in Application					
Application Rate		Nitrogen		Phosphate		Potash	
Tonnes/Ha	Tonnes/acre	kg/ha	units/acre	kg/ha	units/acre	kg/ha	units/acre
5	2	**33**	27	**42**	34	**43**	34
10	4	**67**	53	**84**	67	**86**	68
12.5	5	**83**	67	**105**	84	**107**	86
15	6	**100**	80	**126**	101	**128**	103

Maximum application rate

Poultry manure is normally applied at between 5 and 15 T/Ha (2 and 6 tonnes/acres).

For more information, check Section 4 of the Prevention of Environmental Pollution From Agricultural Activity (PEPFFA) guidance (https://www.gov.scot/publications/prevention-environmental-pollution-agricultural-activity-guidance/pages/4/)., and the 4 Point Plan (https://www2.gov.scot/Resource/Doc/47007/0017626.pdf)

Importance of pH

In order that nutrients can be fully utilised it is essential that the soil is at the correct pH of between 5.8 and 6.0 for grassland. Further information on liming materials and lime requirement can be found in TN714 – Liming materials and recommendations (https://www.fas.scot/publication/technical-note-tn714-liming-materials-and-recommendations/).

For example, the lime requirement for permanent pasture at a pH of 5.3 on a Humose soil is 3 T/Ha of a material with a neutralising value (NV) of 50%. If using shell sand, note the sand has an NV of 27% therefore an adjustment has to be made. Using the calculation shown in example 2 of TN714, the Adjusted rate = (50/27 x 3) = 5.6T/ha of shell sand is required.

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Grassland Fertiliser Requirement

The fertiliser requirement of grassland is dependent on how you intend to manage it. Relatively little will be required for extensive grazing, whilst intensive silage production results in a lot of nutrient offtake, which needs to be replaced.

To work out nutrient requirements, use the Technical Note TN726 – Fertiliser recommendations for grassland (https://www.fas.scot/downloads/tn726-fertiliser-recommendations-for-grassland-scotland/).

Example:

As an example for use of poultry manure on an inbye grass field, the following is from a croft in Argyll. It has a field managed for a cut of silage and then grazing.

Table 4 below shows the nutrient requirement for a field under this management. The nutrient requirement is taken from Tables F(1), I, J, K, L and M in the Technical Note TN726.

The field has humose soil, a pH of 5.3, low Phosphate status and moderate Potash status. The croft has access to shell sand for liming (estimated neutralising value of 27%), poultry manure for organic manure and bagged fertiliser for inorganic manure.

Table 4- Nutrient requirements for established grassland

Nutrients required for Established Grassland 1 cut silage (18t/Ha) followed by grazing						
Low Phosphate, Moderate Potash						
	Nitrogen		Phosphate		Potash	
	kg/ha	units/acre	kg/ha	units/acre	kg/ha	units/acre
Silage	120	96	91	72.8	108	86.4
Grazing	70	56	3	2.4	2	1.6
Total	190	152	94	75.2	110	88

Comparing Tables 2 and 4 an application rate of 12.5 tonnes/ha will supply all the phosphate and potash required and almost 70% of the nitrogen required provided the manure is applied in early spring. The remainder of the potash and phosphate not available to the grass in the year of application will be added to the soil reserves. The remainder of the nitrogen requirement can be made up using bagged fertiliser.

Based on typical fertiliser values for Ammonium Nitrate, Triple Super Phosphate and Muriate of Potash of £240, £300 and £280 respectively the value of available nutrient applied with the 12.5tonne/ha application is £58.10 of Nitrogen, £68.25 of Phosphate and £50.29 of Potash. In addition, the application will apply Sulphate, Magnesium and other micronutrients.

It should be noted that the poultry manure should be allowed to breakdown fully before grazing or cutting (at least one month) to prevent transmission of pathogens.