

What's the potential nutrient value in slurry and manure on your farm?

[Refer to Section 2.2 for Tables 2-4]

Section 2.2 has helped you calculate the **amount of slurry and manure produced over the housed period**.

This section can help you to **estimate the financial value of the total nutrients** and **work out the N:P:K ratio**.

Total or available...?

Total nutrients refer to the amount of nutrients contained within the slurry or manure.

Available nutrients refer to the amount available to the growing crop in the season of application.

Keeping totals for slurry and manure separate, calculate the **potential nutrient values** contained in slurry and manure from housed livestock using Table 2 (Section 2.2) and Table 5, adding your values in to Table 6.

Table 5. Typical values of dry matter and nutrient contents contained in livestock slurries and manures (From SAC Technical Note 650, 2013).

Manure Type	kg/t (solid manures) or kg/m ³ (liquids and slurries)				
	Dry matter (%)	Total N	Readily Available N	Total P ₂ O ₅	Total K ₂ O
Cattle FYM (fresh)	25	6.0	1.2	3.20	8.00
Cattle FYM (old)	25	6.0	0.6	3.20	8.00
Cattle Slurry	6.	2.6	1.20	1.20	3.20
Sheep FYM (fresh)	25	7.0	1.4	3.2	8.0
Sheep FYM (old)	25	7.0	0.70	3.20	8.0
Pig FYM (fresh)	25	7.0	1.80	6.00	8.00
Pig FYM (old)	25	7.0	1.00	6.00	8.00
Pig slurry	4	3.6	2.50	1.80	2.40
Broiler/ turkey litter	60	30	10.5	25	18
Duck FYM (fresh)	25	6.5	1.6	5.5	7.5
Duck FYM (old)	25	6.5	1.0	5.5	7.5
Horse FYM	30	7.0	0.7	0.5	6.0

Calculating Total N produced by housed livestock

To calculate the Total N in slurry or manure for each livestock type, use Table 6. Two examples have been included for reference.

- Write livestock type, whether it is a slurry or manure and number of livestock in the first three columns.
- Put the volume of slurry or manure (m³) produced per week (from Table 2), into column 4 and the number of weeks you have the livestock is housed in column 5.
- Use Table 5 to get the reference value for Total N in slurries (kg per 1 m³) or manures (kg in 1 t) produced by 1 livestock.
- Work along the row to multiply the number of livestock by the volume of slurry or manure produced and multiply again by the number of housed weeks. Then multiply by the Total N in the slurry produced by 1 animal, putting the total in column 7.

This will give you an estimation of the Total N (kg) contained in the slurry or manure over the housed period.

Table 6. Total N produced from the slurry or manure for each livestock type.

1	2	3	4	5	6	7
Type of livestock	Slurry or manure?	Number of livestock	Volume of slurry or manure (m ³ /week) (from Table 2)	Number of weeks housed	Total N in slurry (kg in 1 m ³) or in manure (kg in 1 t) produced by 1 livestock (from Table 5)	Total N produced (kg) from manure or slurry over housed period
Dairy cow (> 9000 L milk yield)	Slurry	100	x 0.45	x 26	x 2.6	= 3042
1 Steer/ heifer 3 to 13 months	FYM (fresh)	100	x 0.14	x 26	x 6.0	= 2184
			x	x	x	=
			x	x	x	=
			x	x	x	=
			x	x	x	=
			x	x	x	=
*Total N produced by all livestock (kg)						=

Example:

To calculate the Total N in the volume of slurry produced by 100 dairy cows (> 9000 L of milk yield):

- Multiply the number of livestock (100) by the volume of slurry produced in a week (0.45 m³/week) to get a weekly amount = **45 m³/week**.
- Multiply the weekly amount of slurry produced by livestock (45 m³/week), by the number of weeks that they are housed (26 weeks in this example). This will give the total volume of slurry produced = **1,170 m³ over the housed period**.
- Multiply by the Total N in slurry (kg in 1 m³) taken from the reference Table 5 (2.6 kg/m³) by the total volume of slurry produced (1,170 m³) to work out the Total N produced from the slurry (kg) over the housed period = **3,042 kg total N produced**.

**Note this is the total N and has been included for illustration. Losses may occur during storage, handling and application method.*

Calculating Total P₂O₅ produced by housed livestock

To calculate the Total P₂O₅ produced from slurries or manures for each livestock type, complete Table 7:

- Write livestock type, whether it is a slurry or manure and number of livestock in the first three columns.
- Write down the volume of slurry or manure (m³) produced per week (From Table 2), in column 4 and the number of weeks the livestock is housed in column 5.
- Use Table 5 to get the reference value for Total P₂O₅ in slurry (kg per 1 m³) or manures (kg in 1 t) produced by 1 livestock.
- Work along the row to multiply the number of livestock by the volume of slurry or manure produced and multiply again by the number of housed weeks.
- Multiply by the Total P₂O₅ in the slurry produced by 1 livestock, putting the total in column 7.

This will give you an estimation of the Total P₂O₅ produced (kg) from the slurry or manure over the housed period.

Table 7. Total P₂O₅ produced from the slurry or manure for each livestock type.

1	2	3	4	5	6	7
Type of livestock	Slurry or manure?	Number of livestock	Volume of slurry or manure (m ³ /week) (from Table 2)	Number of weeks housed	Total P ₂ O ₅ in slurry (kg in 1 m ³) or in manure (kg in 1 t) produced by 1 livestock (from Table 5)	Total P ₂ O ₅ produced (kg) from manure or slurry over housed period
Dairy cow (> 9000 L milk yield)	Slurry	100	x 0.45	x 26	x 1.20	= 1404
1 Steer/ heifer 3 to 13 months	FYM (fresh)	100	x 0.14	x 26	x 3.2	= 1164.8
			x	x	x	=
			x	x	x	=
			x	x	x	=
			x	x	x	=
Total P₂O₅ produced by all livestock (kg)						=

Calculating Total K₂O produced from housed livestock

To calculate the Total K₂O produced from slurries or manures for each livestock type, use Table 8.

- Record livestock type, whether it is slurry or manure and the number of livestock in the first three columns.
- Write down the volume of slurry or manure (m³) produced per week (from Table 2), into column 4 and the number of weeks the livestock is housed in column 5.
- Use Table 5 to get the reference value for Total K₂O in slurries (kg per 1 m³) or manures (kg in 1 t) produced by 1 livestock.
- Working across the row, multiply the number of livestock by the volume of slurry or manure produced and multiply again by the number of housed weeks.
- Multiply by the Total K₂O in the slurry produced by 1 livestock, putting the total in column 7.

This will give you an estimation of the Total K₂O produced (kg) from the slurry or manure over the housed period.

Table 8. Total K₂O produced from the slurry or manure for each livestock.

1	2	3	4	5	6	7
Type of livestock	Slurry or manure?	Number of livestock	Volume of slurry or manure (m ³) (from Table 2)	Number of weeks housed	Total K ₂ O in slurry (kg in 1 m ³) or in manure (kg in 1 t) produced by 1 livestock (from Table 5)	Total K ₂ O content of slurry or manure produced (kg) over housed period
Dairy cow > 9000 L milk yield)	Slurry	100	x 0.45	x 26	x 6.00	= 7020
1 Steer/ heifer 3 to 13 months	FYM (fresh)	100	x 0.14	x 26	x 8.0	= 2912
			x	x	x	=
			x	x	x	=
			x	x	x	=
			x	x	x	=
Total K₂O produced by all livestock (kg)						=

Converting Total P₂O₅ to Total P and Total K₂O to Total K

Using Table 9, write in the Total N (from Table 6), Total P₂O₅ (from Table 7) and Total K₂O (from Table 8) of the various slurries and manures produced.

- Write down the type of livestock and manure or slurry in the first two columns.
- From Table 6, write the Total N content for that livestock in kg in column 3.
- From Table 7, write the Total P₂O₅ (kg) for each livestock type into the column 4.
- From Table 8, write the Total K₂O (kg) content into column 6.

The Total P and Total K contents must be calculated first before calculating the N:P:K ratio:

- Multiply the Total P₂O₅ content for each livestock type by 0.436 and write it in column 5 to give the Total P content of the slurry or manure.
- The Total K can be calculated by multiplying the Total K₂O value in column 6 by 0.830 and written in column 7.

Table 9. Total nutrients and NPK ratio produced from the slurry or manure for each livestock.

1	2	3	4	5	6	7	8
Type of livestock	Slurry or manure?	Total N content of slurry or manure produced (kg) (From Table 6)	Total P ₂ O ₅ content of slurry or manure produced (kg) (From Table 7)	Total P content (multiply P ₂ O ₅ value by 0.436)	Total K ₂ O content of slurry or manure produced (kg) (From Table 8)	Total K content (multiply K ₂ O value by 0.830)	Ratio of NPK from columns 3, 5 and 7) (divide by smallest value)
Dairy cow (> 9000 L milk yield)	Slurry	3042	1404	612.1	7020	582.6	4.97 : 1 : 9.5
1 Steer/ heifer 3 to 13 months	FYM (fresh)	2184	1164.8	507.85	2912	2416.96	4.3 : 1 : 4.76
Total nutrients produced by all livestock types		=	=	=	=	=	

Example:

In the example, dairy cow (> 9000 L milk yield) slurry production contained the following nutrients (kg):

- Total N (Table 6) = **3,042**
- Total P₂O₅ (Table 7) = **1,404**
- Total K₂O (Table 8) = 7,020

These are written into Table 9 in columns 3, 4 and 6. To calculate the Total P and Total K content of the slurry (kg):

- Multiply the Total P₂O₅ value in column 4 (1,404) by 0.436 to give a value for Total P = **612.1**.
- Next, multiply the Total K₂O in column 6 (7,020) by 0.830 to get the Total K value = **5,826.6**

For this example, the table should contain:

- Total N (column 3) = **3,042**.
- Total P (column 5) = **612.1**.
- Total K (column 7) = **5,826.6**.

Working out N:P:K ratios

To calculate the N:P:K ratio of the slurry or manure for each livestock type, look at all three values in columns 3, 5 and 7 and find the smallest number. To get the ratio, divide them all by the smallest number. In this example, the smallest value is for the Total P at 612.1. Divide the Total N, P and K values by 612.1 as shown here:

- Total N (column 3) = 3,042 / 612.1 = **4.97**.
- Total P (column 5) = 612.1 / 612.1 = **1**.
- Total K (column 7) = 5,826.6 / 612.1 = **9.5**.

Therefore the slurry NPK ratio is **4.97 : 1 : 9.5** This ratio can be written in column 8 in Table 9.

Your figures in Table 9 now provide a useful estimate of the potential total N, P₂O₅ and K₂O and Total P and K produced by your housed livestock along with N:P:K ratios of different livestock slurries and manures.

Estimating financial value of total nutrients

- To estimate the financial value of the nutrients take the **total P** value and;
- multiply this by the cost of P per kg (around 68p/kg P₂O₅ at current prices).

This gives the purchase cost of the equivalent amount of P fertiliser. Use the same method to estimate K, using the price per kg (around 45p/kg K₂O at current prices).

Often, **all crop requirements for P and K** can be met through **wise slurry and manure application**, saving on your fertiliser bill. Calculations for estimation of **available N** have not been included in the tables, as many factors can influence these levels.

An agricultural consultant will be able to look at nutrient balances on your farm in detail, highlighting opportunities to improve nutrient use, save money and improve your environmental performance.

Computer programs such as MANNER-NPK and PLANET Scotland are available to calculate approximate N values within slurry and manure enabling you to make your own adjustments to N application.



Further information

More ideas to reduce diffuse pollution risk and benefit the farm business are at www.farmingandwaterscotland.org

Scotland's Farm Advisory Service (FAS) also hold a range of information and run a free helpline - visit www.fas.scot for more information.

*This information is updated and abridged from The 4 Point Plan (2003). Version as of 01/04/20.
Comments? Contact us at farmingandwater@sac.co.uk*



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