

# MANURE TRANSPORTATION IN EUROPE - CONSIDERATIONS FOR SPATIALLY DISTRIBUTED MODELLING OF VETERINARY MEDICINES

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## Background

Spatially distributed modelling approaches can provide an increased level of realism to the environmental risk assessment process. For veterinary medicines (VMPs), this type of approach could allow multiple factors such as climate, soil type and land use to be used to contextualise 'reasonable worst case' scenarios as well as identify areas vulnerable to chemical risk. Furthermore this type of approach could be used to enhance post approval considerations such as facilitating a more targeted approach to eco-pharmacovigilance. However, for VMPs this type of approach is further complicated by the transport of manure containing VMPs off farm, driven by limits on the level of Nitrogen and Phosphorous applied to agricultural land. In these situations, manure containing VMPs could be transported to regions (e.g. arable growing areas) with differing climate, soil type and land use and, in some cases, the manure may not remain within the country where the VMP was used. In this poster we summarise the available information on manure application and transport in Europe and consider the implications for spatially distributed modelling approaches.

## Sweden and Finland<sup>7</sup>

Case study of 3 farms found transport of cattle slurry was economically viable up to 10 km away from the farm and transport of swine manure was economically viable up to 9-10 km from the farm. Application method had a small impact on transport distances whereas subsidies and removing liquid from manure had a slightly larger impact.

## UK<sup>5,6</sup>

Approximately 83 million tonnes of manure is produced annually, 80% of which is cattle manure. The value of manure in the UK was calculated to be:

- Cattle slurry (6% DM): £2.80/tonne
- Pig FYM (25% DM): £7.90/tonne
- Broiler litter (60% DM): £30/tonne

Assuming anaerobic digestion before land application, the following distances were calculated as economically viable in UK:

- 16 km (cattle slurry/pig FYM)
- 80 km (broiler litter)

## The Netherlands<sup>2,3,4</sup>

54.8 million tonnes of cattle slurry, 12.4 million tonnes of pig slurry and 1.4 million tonnes of solid poultry manure are produced annually. In 2011, 74% manure was applied on farm (mainly dairy) and 26% exported off farm (mainly pig and poultry); 23.1% of which was transported within NL and 2.9% transported outside NL.

Restrictions on manure application are in place and policy changes in 2014 ensure excess manure is processed and exported off-farm.

- Livestock farmer pays approximately €10 - €23/tonne to transport manure
- Arable farmer receives €3 - €10/tonne to apply manure

Economically viable to transport liquid manure up to 150 km and solid manure up to 300 km.

## Manure processing<sup>2,3</sup>

Manure processing can improve nutrient and organic matter content and reduce water content, therefore, reducing transport costs. Options for manure processing include:

- Incineration
- Anaerobic digestion
- Mechanical separation
- Reverse osmosis
- Composting/pelleting

## Conclusion

Variations in manure application, processing and transport exist across Europe. Many countries have restrictions in place for manure application, linked to minimising Nitrogen and Phosphorous losses. Manure transport is more likely in areas of high livestock density (e.g. NL, DE) and policy (e.g. NL) has a noticeable impact on the economic viability of manure transport. There is limited information available on southern and central European countries and more work is needed to understand the factors influencing manure transport in these countries. However, the information presented here suggests characterising manure transport in The Netherlands, Germany and Belgium would be important in the development of a spatially distributed modelling approach for VMPs.

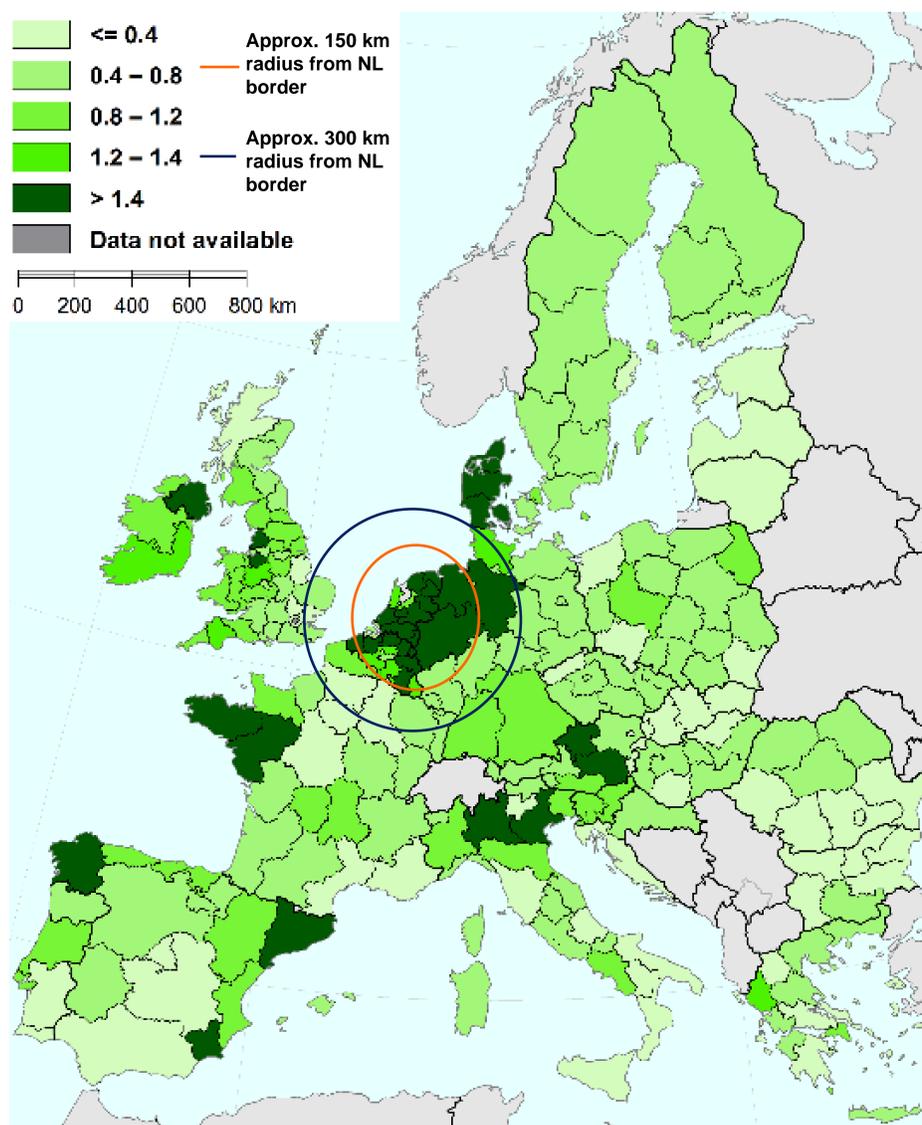


Figure 1 – EU Livestock density by NUTS 2 regions in 2013 (LSU/ha) (EUROSTAT)<sup>8</sup>

## Livestock density

Livestock density (shown on Figure 1) reflects the number of livestock units (LSU) (calculated according to the number of livestock and their nutritional/feed requirements) per hectare of utilised agricultural area (UAA) (arable land, permanent grassland, permanent crops and kitchen gardens). Areas of higher livestock density can be an indicator of regions where there is limited land for manure application. In these areas it is more likely that alternative routes for manure disposal (e.g. manure transportation, incineration) will be relevant. Figure 1 suggests that The Netherlands, North West Germany, Eastern Belgium and Western Denmark may be under particular pressure from manure production.

## Finland<sup>1</sup>

Approximately 18 million tonnes of manure (mainly from cattle) are produced annually. The majority of manure is spread to land without processing and only 1.1% of manure is used in biogas. Geography (e.g. large number of lakes) has led to a fragmented farm structure and long distances between livestock and arable farms. Manure transport costs are, therefore, high and particularly affect livestock production areas in Northern and Eastern Finland.

## Estonia<sup>1</sup>

Manure is applied to 10-16% all agricultural land. Buffer zones in place for surface water (1 m to 20 m depending on water body size) and for springs/karst holes (10 m to 50 m depending on NVZ).

## Lithuania<sup>1</sup>

Uneven distribution of arable and livestock farming. Cattle farms dominate in western LT and arable farms dominate in central LT resulting in low utilisation of manure on arable farms. Buffer zones in place for slurry application (e.g. 2 m from drainage ditches).

## Poland<sup>1</sup>

Larger livestock farms must apply  $\geq 70\%$  of manure on their own arable land and 30% can be sold as a fertilizer. Restrictions in place including buffer zones (e.g. 20 m for certain protected areas, lakes and rivers).

## Germany<sup>1</sup>

>200 million tonnes of manure are produced annually in addition to manure imports from The Netherlands. Areas of high livestock density include North West Germany, former East Germany and Upper Bavaria. Manure from these areas is often transported to areas of lower animal density. Restrictions on manure application are in place (e.g. land type, frozen or flooded land) and 1-3 m buffer zones for surface water.