

## **Manure treatment technologies to solve the nutrient surpluses in regions with intensive livestock farms in The Netherlands**

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Dr Oscar Schoumans, Wageningen Environmental Research, [oscar.schoumans@wur.nl](mailto:oscar.schoumans@wur.nl)

The livestock farms of the Netherlands are intensive. This causes a surplus of animal manure. Since 2002 a phosphate production ceiling of 172.9 Mio kg P<sub>2</sub>O<sub>5</sub> limits the total phosphate production in terms of animal manure in the Netherlands. This limit was set by the Europe Commission as a stipulation of the derogation for the limit of the Nitrate Directive (maximum application of 170 kg N per ha from animal manure) to a higher limit for dairy farms with mainly grassland. In 2015 the European milk quota system was abandoned and caused the milk production in the Netherlands to increase due to more cows. The increase of animal manure production on dairy farms caused an increase of the phosphate production which exceeded phosphate production ceiling. On the short term actions were taken amongst others a stipulation on the maximum number of animals, but it became clear, both for the farmer organisations as well as for the Government, that on the long term other innovative approaches are needed to create more space for investments in order to derive a vital and sustainable intensive livestock farms. Over the last decades the intensive livestock farms (e.g. pigs) paid high costs to transport of their surplus of manure outside the Dutch agriculture, while on the other hand mineral fertilisers have to be bought by farmers to meet with the crop nutrient requirements. This has initiated new and innovative manure treatment technologies for a better closure of the nutrient cycle.

The focus in the Netherlands is to reach maintenance fertilisation. For this application standards for nitrogen and phosphate are operational within the framework of the Fertiliser Act. The Dutch application standards for nutrients (nitrogen and phosphate) limit the total amount of nutrients which can be applied on agricultural land and furthermore the application of manure in terms of nitrogen is restricted. The phosphate application standards are dependent on soil phosphate status of each field and due to the relatively high soil phosphate status mainly limit the manure application on agricultural land. Today about 130 Mio kg phosphate can be applied on agricultural land. As a result 25% of the animal phosphate production cannot be applied and has to be treated and/or is exported.

The poultry livestock farms have developed their own stable poultry litter processing systems. About 30% of the litter is incinerated and the other part is composted and/or dried (palletisation is becoming a more regular processing technique). These products of processing poultry litter are exported to other European agriculture (mainly France, next Germany, Hungary).

The dairy livestock farms have their own land and is often able to manage their field nutrient input-output balances. Due to the fact that the N-P-ratio of dairy slurry is high, this type of manure is also well accepted by farmers with arable land. However, due to the more strengthened application standards over time manure treatment technologies have been implemented, mainly based on separation techniques. The nutrient management at dairy farms has better perspectives to reach balanced fertilisation when slurry is separated as most of phosphate is associated to the solid fraction and water, nitrogen and potassium to the liquid fraction. Unfortunately also organic matter is dominantly present in the solid fraction and is also exported from the farm.

The pig livestock farms have to come up with the most challenging and innovative manure processing techniques as they have enough land that can accept the nutrients (approx. 38 Mio kg phosphate). They pay the highest price to get rid of their manure surplus. In the last two years the prices varied between 20 and 25 € per ton pig slurry. The current base flow is sanitation of the slurry or the solid fraction and export of those products (Germany and Belgium). However the

focus is changing to large scale nutrient recovery (ammonium sulphate, mineral concentrates, calcium phosphate and phosphate depleted organic fraction) and discharge of cleaned liquid fraction to surface waters. This affiliates with the European and National policy to implement a more sustainable circular economy.

In my presentation, the main implemented manure processing technologies and costs will be outlined together with the new innovative approaches and initiatives of nutrient recovery and recycling with support of the agricultural sector, SME's and industries.