

‘At last something is being done about the phosphate problem’

## Oscar Schoumans, manure and minerals expert

24.03.

09 On 24 March 2009, results of thirty years of phosphate research were presented to Parliament.

Made by Alterra, 2000-2010

For the last twenty-five years, researchers have been warning that maize fields and grasslands contain ever-increasing amounts of phosphate. But it took until 1 January 2010 before regulations were introduced to reduce the amounts of manure farmers are allowed to spread on soils high in phosphate. Phosphate researcher Oscar Schoumans says: ‘This means we’ll have to make manure processing more profitable.’

### by Marianne Heselmans

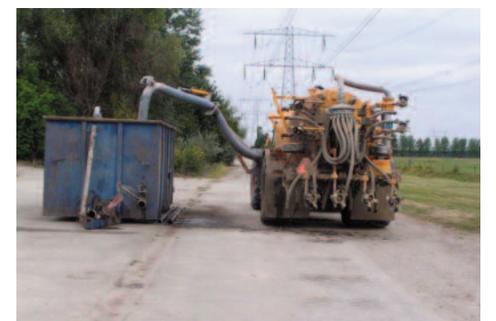
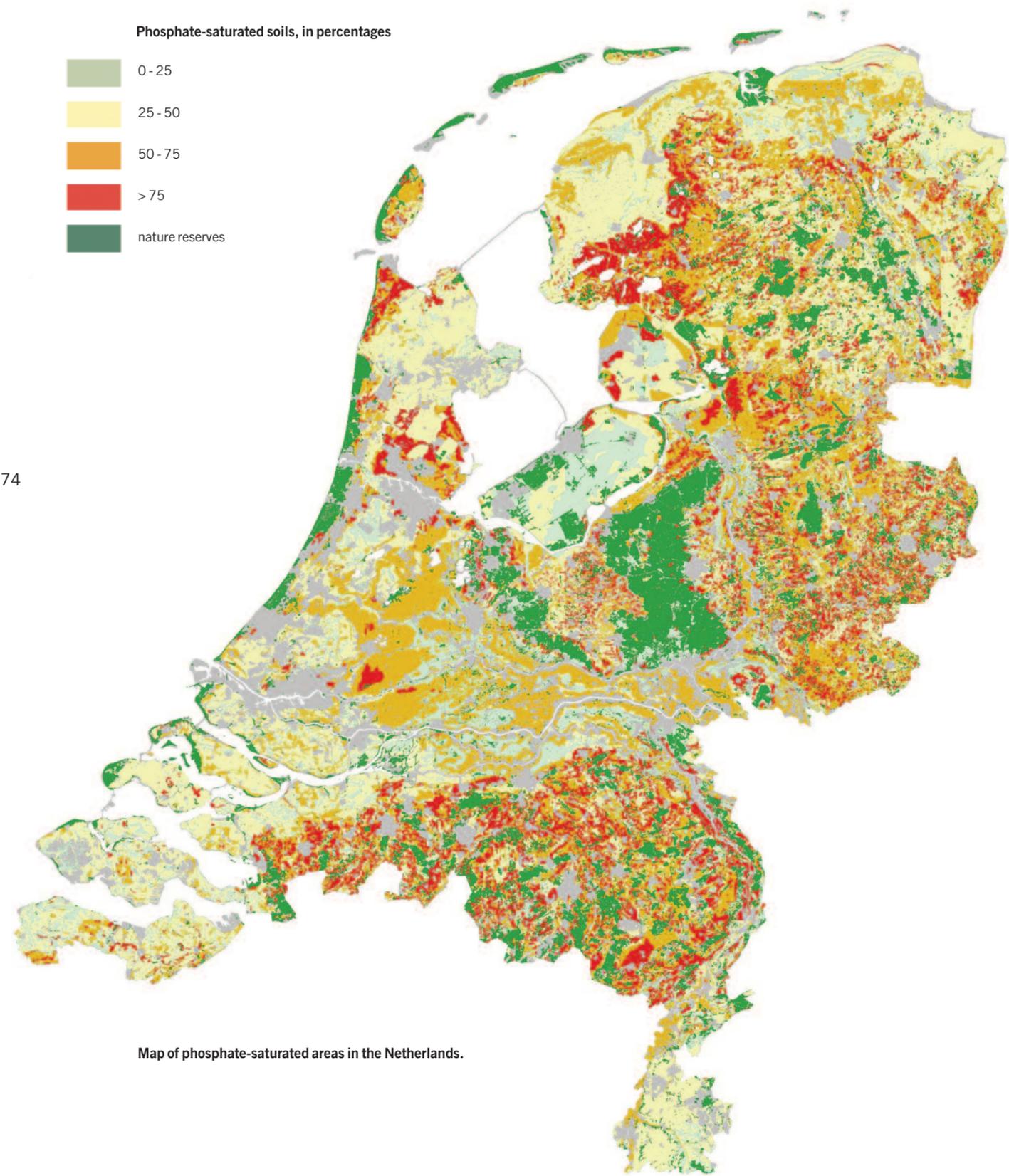
On 24 March 2009, Oscar Schoumans was working as usual in his office in Wageningen. He was answering e-mails, preparing a poster on innovative manure-processing methods, and finishing an article. At some moment during this day, probably in the morning, the Dutch Ministry of Agriculture, Nature and Food Quality sent a memorandum called Fourth Dutch Action Programme on the Nitrate Directive (2010–2013) to the Lower Chamber of Parliament. Nothing special, one might think. But this memorandum included a few pages based on the results of thirty years of phosphate research.

Both the Lower Chamber and the European Union have since accepted the proposals made in the memorandum. ‘This is the first time something is actually being done about the phosphate problem’, says an enthusiastic Schoumans in his Alterra office, as he pulls some maps sho-

wing phosphate-saturated soils out of a filing cabinet. ‘Twenty-five years ago we were already warning that phosphate was becoming a problem in areas with a manure surplus. In 1986 we made the first maps showing phosphate-saturated soils. Another few years of research showed how much phosphate was accumulating in the soil. Although manure legislation was soon tightened up after that, farmers were still allowed to spread more phosphate than their crops needed. It’s only since 1 January 2010 that they have to adapt the manure applications to the amount of phosphate already contained in the soil. If the concentration is too high, they’re no longer allowed to spread more phosphate than the crop can take up from the soil.’

For all these years, Alterra’s research clearly revealed the magnitude of the problem. In the 1970s and 80s, when farmers were still free to spread as much slurry as they wanted, an annual average of between 250 and 750 kg of phosphate per hectare was applied on the maize fields in the areas with a manure surplus, seven to ten times more than the amount taken up by the crop. Although the average annual amount fell to about 250 kg per hectare in the early 1990s, this was still much too high. A large proportion of the manure surplus was transported to other parts of the Netherlands or abroad, and the result was that in the late 1990s, the top 50 cm of a hectare of farmland soil contained an average of 5000 kg of phosphate, as was shown by a





input	1970	1986	1995	2000	2005	output	1970	1986	1995	2000	2005
concentrates	38	78	81	69	59	animal products	16	26	23	23	29
P in fodder	21	16	7	5	7	vegetable products	10	16	7	5	7
roughage	1	2	3	3	3	animal manure	-	0	5	6	7
mineral fertiliser	47	37	27	27	21	total output	26	41	55	55	60
other manures	4	5	6	5	6	surplus	85	97	69	54	36
<b>total input</b>	<b>111</b>	<b>138</b>	<b>124</b>	<b>109</b>	<b>96</b>	<b>total output</b>	<b>111</b>	<b>138</b>	<b>124</b>	<b>109</b>	<b>96</b>

**Phosphorus balance of Dutch agriculture, in millions of kg per hectare (1970–2005). A large proportion of the surplus ends up being spread on farmland. The magnitude of the surplus can be monitored by showing the phosphate balance of Dutch agriculture over time. The surplus peaked in 1985, and has fallen since. (Source: Statistics Netherlands)**

national soil sample survey. The average could even be as high as 10,000 kg in heavily fertilised fields.

Fortunately, eighty percent of the phosphate binds to iron and aluminium particles in the soil, so no more than twenty percent can leach to the groundwater and surface water. But with 2000 to 10,000 kg of available phosphate in the topsoil, twenty percent is still a huge amount. ‘The effects were observed in the early 1980s’, explains Schoumans, ‘as the water in ponds, ditches and lakes near heavily fertilised fields was green with duckweed and algae, suffocating the other species.’

Although this was partly caused by phosphates from household detergents released into surface waters, and discharges from sewage treatment plants, the detergent industry has greatly reduced phosphate contents and sewage treatment techniques have been greatly improved, so a growing percentage of eutrophication is due to farming.

After the first warnings by environmentalists in the 1980s, the Ministry commissioned studies to assess what legislation could effectively reduce phosphate inputs. But as Schoumans remembers, none of the proposed measures was economically feasible. If the amounts of manure that farmers were allowed to spread were drastically curtailed, the amounts of slurry to be disposed of would soar, resulting in high disposal costs. This would drive many pig farmers to bankruptcy. ‘The Ministry therefore decided to reduce manure spreading gradually’, which explains why Dutch legislation on manures and fertilisers is still rather lenient. The fourth Action Programme also intends to gradually tighten up regulations, so that farmers will ultimately be allowed to spread very little phosphate on the most phosphate-saturated lands.

Asked about his own role in this process, Schoumans feels that ‘lobbying’ is not the right word. ‘It’s not our task to lobby. What Alterra is good at is estimating the consequences of certain policy measures. It’s then up to the politicians to weigh up the costs – in this case to pig farmers – and the benefits to nature. One aspect that caused delays in adopting stricter regulations is of course that it is easy to calculate the costs to pig farmers, but very hard to put a price on the benefits of nature to society. So we were helped by the stricter European guidelines and the European Commission’s pressure on the Netherlands to reduce nutrient emissions.’

Even with this stricter manure policy, however, it will take dozens of years before phosphate stops leaching from maize fields and grasslands in the wet areas with shallow groundwater, Schoumans expects. But this does not mean that it will also take that long before the Moor frog, Water lobelia and Small red damselfly return to Dutch waters. Fairly quick results can be obtained using technologies that involve changing flow patterns or water tables, constructing helophyte filters or getting brooks to meander again. ‘But at last now something is being done about the emissions of phosphate to the environment, taking into account the actual phosphate levels in soils’, says Schoumans.

This does not, however, solve the pig farmers’ problem. As of 2010, livestock farmers will be faced with rising manure surpluses, which will continue to grow as phosphate standards become ever stricter. The Ministry of Agriculture has therefore asked Schoumans to lead a manure innovation project in which experts from various departments of Wageningen University and Research Centre will try to find solutions to the problem of the manure surplus. It is not the first time that Wageningen researchers have loo-

ked into this problem, but, says Schoumans, what is new is the integrated approach, involving various disciplines as well as industry and the farmers themselves. ‘It used to be that each individual researcher studied part of the problem, whereas now we’re looking at the overall picture. We’ll also be studying the whole phosphate cycle, from phosphate imports from other countries for fodder to recovering phosphate from manure and phosphate sales.’

Alterra is also studying methods to replace mineral fertilisers and to recover phosphate from manure. Agro-system experts from Plant Research International (PRI) and Wageningen UR Livestock Research are assessing how farms can use phosphate most efficiently, and how solid manure components can best be separated from the urine component and then processed. In addition, livestock researchers are examining whether phosphate levels in fodder can be reduced, and agrotechnologists at the Agrotechnology and Food Sciences Group (AFSG) are trying to find ways to produce better phosphate fodder out of raw material. The project also involves farmers, the slurry processing industry, the phosphate industry and the fodder industry.

Schoumans hopes that farmers will come to regard manure as a product that can earn them a profit. ‘This collaborative project involves so much expertise that it must be possible to make manure processing cost-effective. Just incinerating it to phosphate-rich ashes is such a waste. In a hundred years’ time, it’ll be much harder to mine phosphate

than it is now, making it much more expensive as a raw material for fodder or mineral fertiliser. That’s why we’re collaborating with the slurry processing and phosphate industries to see if phosphate can be extracted from manure in such a way that livestock farmers can make a profit from it.’

Making a profit from manure is a long-term goal. In the short term, the parties participating in the project will try to get relatively well-developed technologies for manure separation, low-phosphate fodder and more efficient manure incineration accepted by farmers, by organising demonstrations and open days at experimental and model farms. The project leader is not discouraged by the fact that previous attempts to sell pig manure processing systems – like the government-funded Promest project – have failed. ‘There is now a greater sense of urgency. And techniques have improved.’

Schoumans and the Executive Board of Wageningen University have had two talks with the Minister of Agriculture, Gerda Verburg, and the manure innovation project was discussed on both occasions. ‘The talks were very positive. The first time we brainstormed about solving the manure problem without wiping out the Dutch intensive livestock sector, which was a precondition imposed by the Ministry. The second time we went through the project proposal together. Isn’t it wonderful that we can contribute directly to solving the Dutch manure problem and at the same time help create new natural habitats?’

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**Ecological recovery of lakes and pools requires phosphate concentrations of the order of 0.05 to 0.08 mg/litre. Little is known about the progress of recovery in watercourses in rural areas. This is currently being researched.**