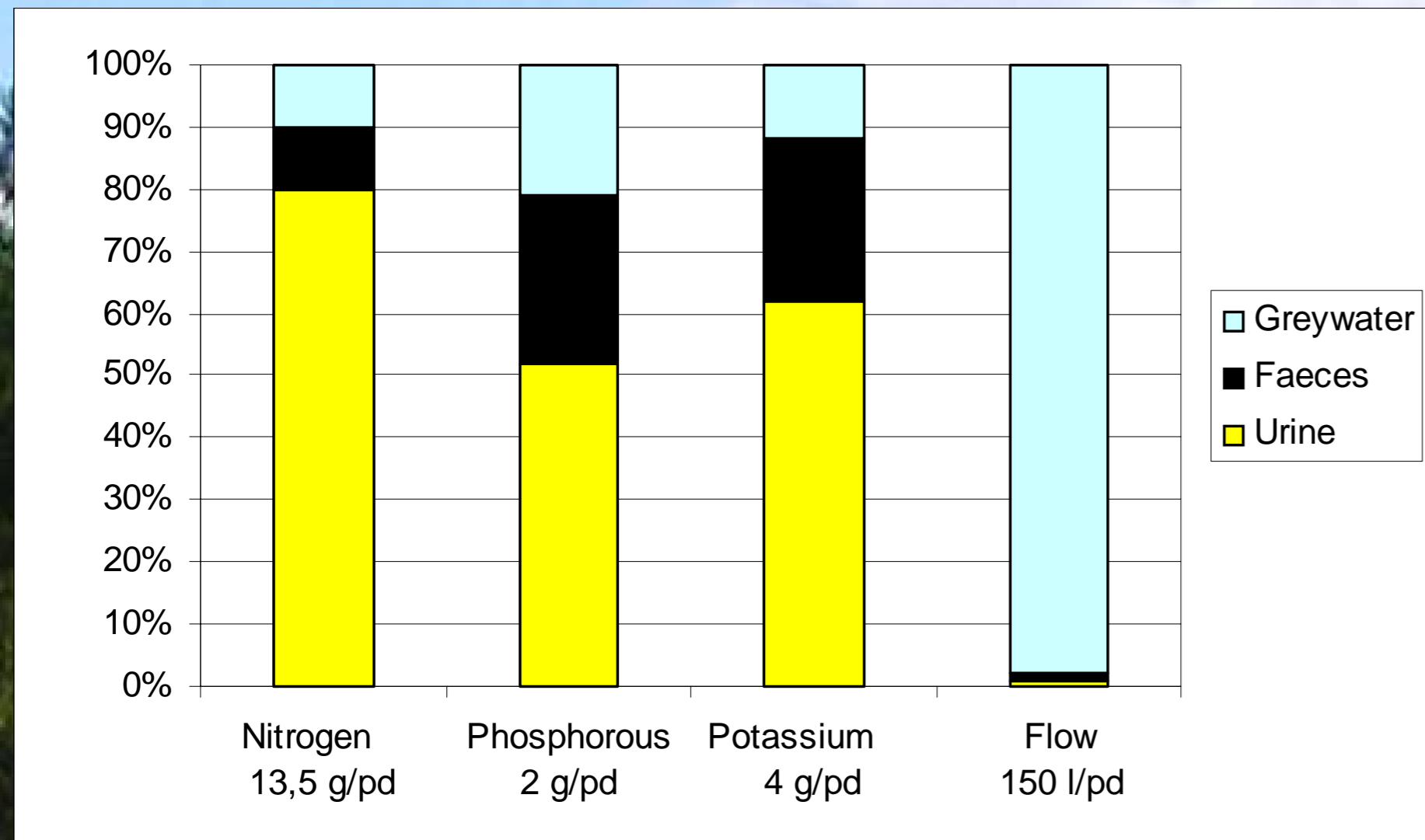


SUSTAINABLE WASTEWATER MANAGEMENT

Nutrients in wastewater are a resource that can be used in agriculture, replacing chemical fertilisers. Recirculation of nutrients is necessary for the system to be sustainable in the long term.



Nutrients and water in different wastewater flows. Flush water is not included.

Toilet wastewater, “blackwater”, is different from the rest of the household water, “greywater”. Almost all of the nutrients are in the blackwater. Urine is very rich in nutrients but contains little pathogens and pollutants. One way to get a sustainable system is to separate the different flows at the source, by ✓ collecting urine in one place, faeces in another, and greywater somewhere else; ✓ collecting urine separately from the rest of the wastewater; or ✓ collecting blackwater separate from the greywater. For farmers, it is important that the end products have a high nutrient content, a low concentration of toxic compounds and a limited hygienic risk.

Urine diversion systems

Urine is separated from the rest of the wastewater

Collects 80-90% of N and 50% of P

Specially designed toilet with a separate collecting bowl

0.5 m³ of urine/ person/year
Urine is stored six months to reduce pathogens

Can be combined with composting of faeces

Greywater needs to be treated separately, e.g. in a filter bed.

With dry handling of faeces, usually low costs



A urine diverting toilet. Urine is collected in the front bowl.

Blackwater systems

Toilet waste is flushed and collected in a storage tank

Collects >75% of P, >90% of N, and a large portion of BOD

Vacuum toilet or water closet with an extremely low flush volume connected to gravity sewers

Important to use very small amount of water for flushing

Treatment, such as liquid composting, is necessary before use to reduce pathogens

Greywater is treated separately, e.g. in a filter bed



A vacuum toilet

There are also treatment methods at the end of the pipe that allow for recycling of nutrients.

Recycling of several nutrients:

Irrigation with sewage

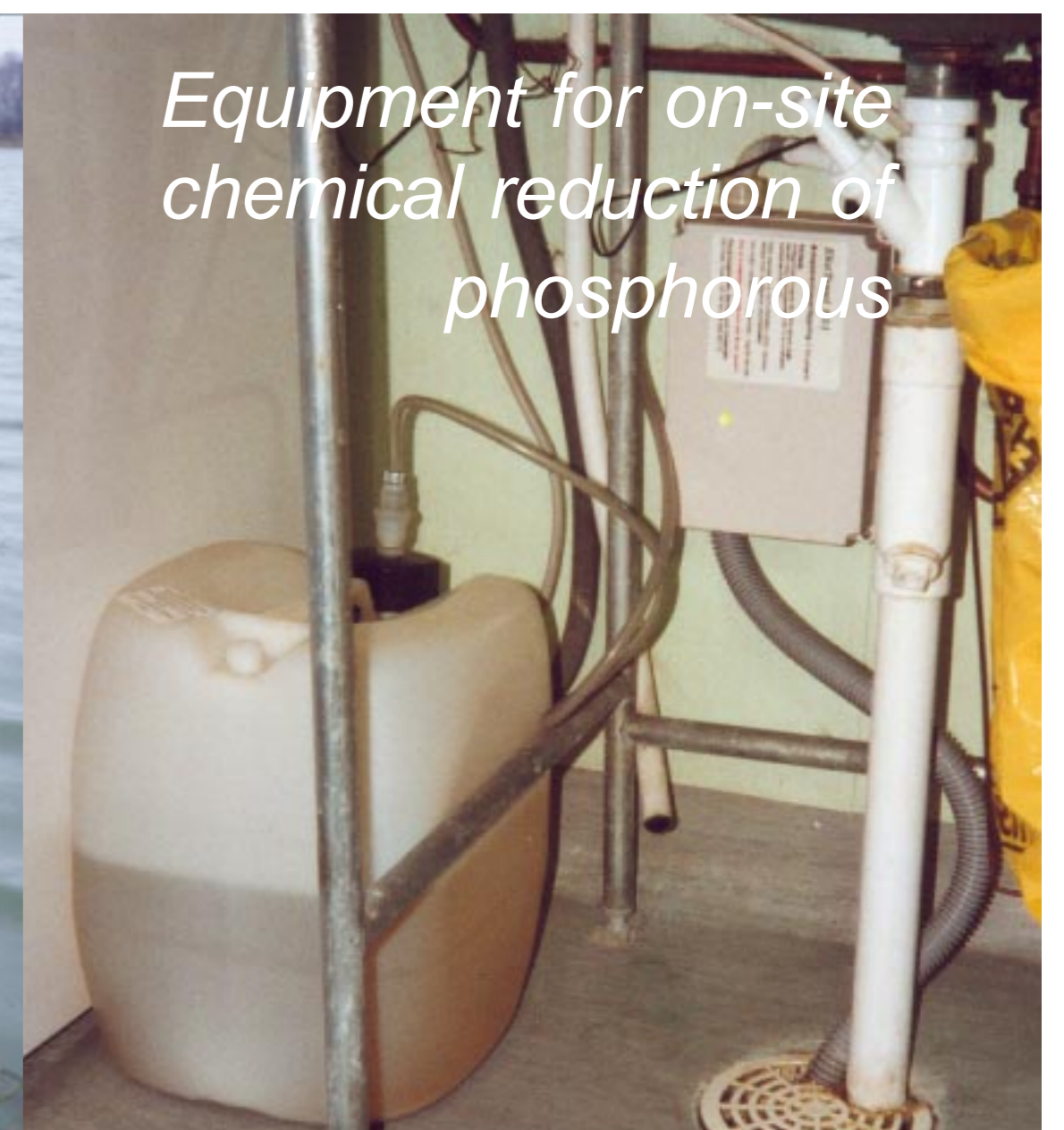
Recycling of phosphorous:

Treatment of mixed wastewater in a reactive filter bed

On-site chemical phosphorous reduction



Sewage pond for irrigation in Gotland, Sweden



Equipment for on-site chemical reduction of phosphorous