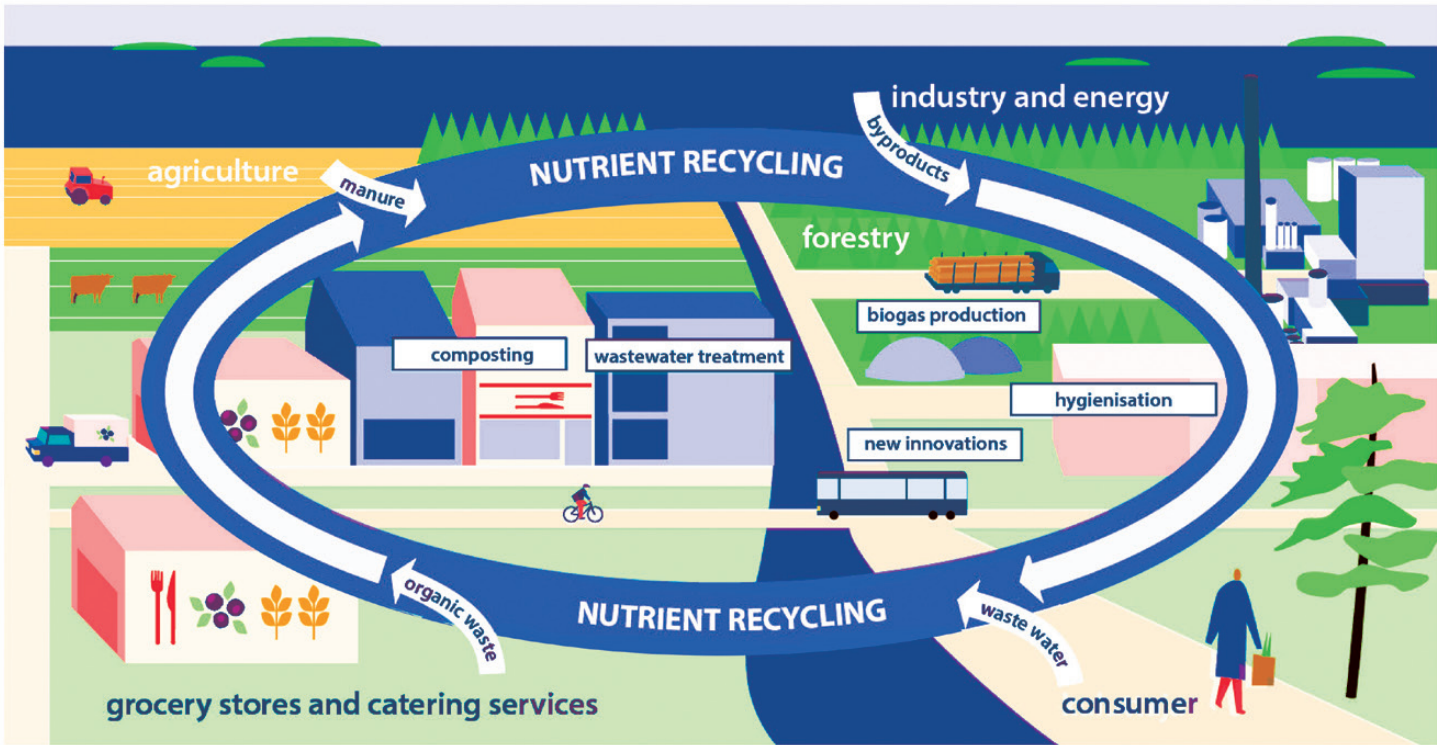


# Recycle nutrients for clear waters

GOVERNMENT KEY PROJECT



Recycled nutrients can be turned into fertilisers and soil amendments which are utilised in food production and forestry.

Finland aims to be a model country in nutrient recycling. Agriculture has a significant role in reaching the goal, as it is the biggest user of phosphorus and nitrogen. Nutrients are mainly used as fertilisers in plant cultivation. Through use of plants as food and feed, nutrients end up to the manure of domestic animals as well as to the municipal sewage sludge and biowaste. In Finland the geographical dissociation of livestock farms producing manure as a side stream and plant production that needs nutrients has resulted in imbalances between nutrient volumes and crop needs. That is why artificial fertilisers are popular in spite of the fact that, theoretically, the phosphorus contained in manure could cover the entire nutrient demand of plants in Finland.

**Recycled fertilisers often contain organic matter, which also improves the fertility of soil. Efficient recycling of nutrients prevents eutrophication of water systems and reduces the need to use artificial fertilisers. It also improves food security and self-sufficiency of food production. In addition to agriculture it is important to improve the efficiency of nutrient recycling in other sectors as well.**

Recycling of nutrients is a key development area in the Finnish government programme as part of the goals to promote circular economy and improve the state of water systems. The aim is to increase the recovery of nutrients, particularly in areas sensitive with regard to the water systems, so that at least 50 % of manure and municipal sewage sludge will be covered by advanced processing by 2025. Even though processing in itself does not guarantee the recycling of nutrients it is often the necessary prerequisite to make recycling happen. Processing helps the conversion of side streams into recycled fertilisers and their transportation to areas where fertilisers are needed.

Further information: Marttinen et al.: Towards a breakthrough in nutrient recycling – State-of-the-art and recommendations for developing policy instruments in Finland. Natural resources and bioeconomy studies, Luke 45/2017

The brochure and info graphs were produced in the Finnish government's key project Making use of agricultural nutrients. The project provides information on nutrient recycling and on different financing alternatives for promoting circular economy.

Further information: [mmm.fi/en/recyclenutrients](http://mmm.fi/en/recyclenutrients)



MAATALOUDEN RAVINTEET  
HYÖTYKÄYTTÖÖN



# Abundance of nutrient-rich biomasses in Finland

Total of nutrient-rich biomasses

**21 100 000 t / year**



**259 000 t**

Food industry side streams



**578 000 t**

Sludges from pulp and paper industry



**667 000 t**

Municipal sewage sludge



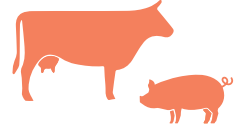
**809 000 t**

Municipal biowaste



**1 510 000 t**

Surplus grass



**17 300 000 t**

Livestock manure

## Comparisons

The mass of the world's largest pyramid, Cheops, is 5.75 million tonnes. The annual mass of nutrient-rich biomasses in Finland corresponds to...



**3.7 pyramids**

The Silja Serenade cruiser weighs about 27 000 tonnes. The annual mass of nutrient-rich biomasses in Finland corresponds to...



**780 cruisers**

Annual municipal waste

**2 740 000 t**

Nutrient-rich biomasses suitable for nutrient recycling

**21 100 000 t**

# Recycled nutrients can replace traditional fertilizers

The total amount of recyclable phosphorus

**26 000 t / year**



**360 t**  
Food industry  
side streams



**230 t**  
Sludges from pulp  
and paper industry



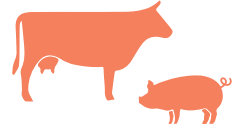
**2 880 t**  
Municipal  
sewage sludge



**730 t**  
Municipal biowaste



**2 540 t**  
Surplus grass



**19 300 t**  
Livestock manure

**26 000 t =**

The portion of recyclable phosphorus  
would easily cover the amount needed  
for all of Finland's annual plant production.

**>100%**



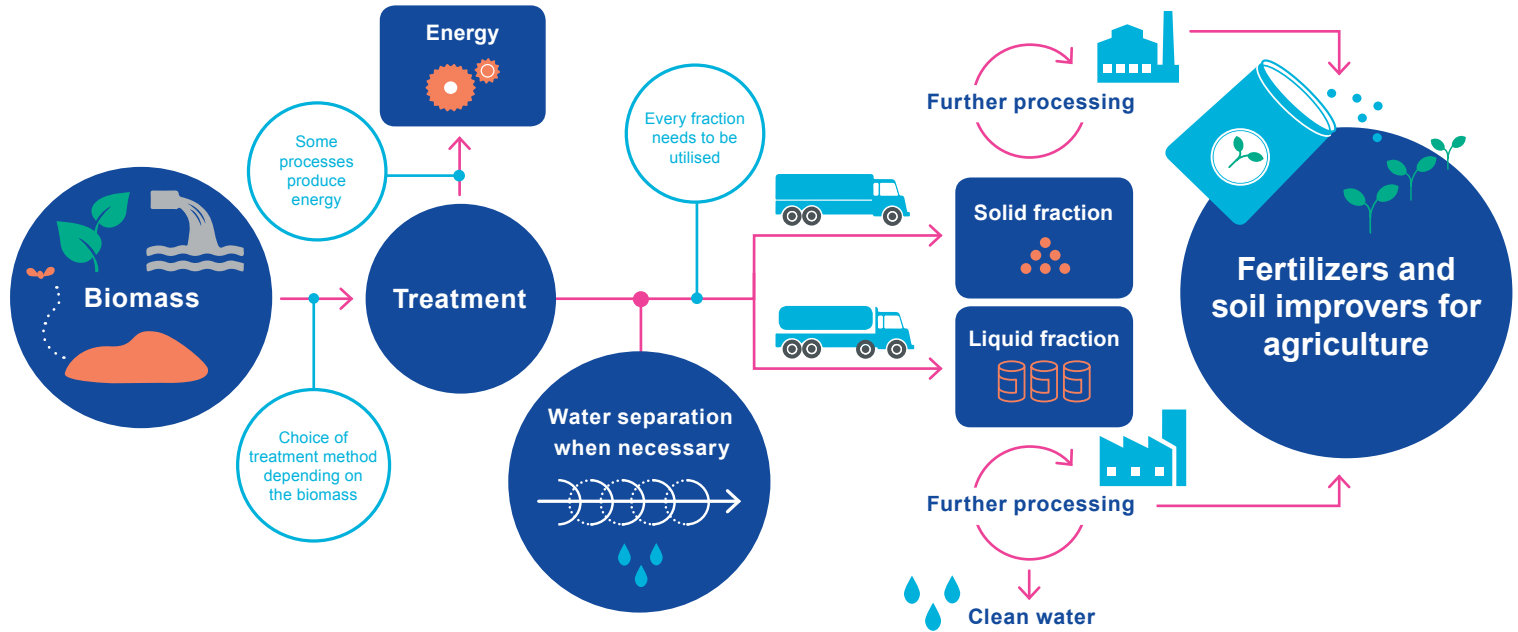
The agricultural  
consumption of traditional  
inorganic phosphorus  
in 2015 was

**11 000 t.**

## What is phosphorus?

Phosphorus is an element mined from the ground, used as a fertilizer to improve plant growth. Phosphorus becomes a problem when it flows into water bodies, where it causes algal blooms and increases eutrophication.

# Processing facilitates nutrient utilisation



## What is biomass?

Biomass refers to organic waste and side streams such as livestock manure, surplus grass, sewage sludge, and municipal and industrial biowaste.

## Treatment methods

Separation  
Drying and concentration  
Membrane technologies  
Composting  
Anaerobic digestion  
Thermal technologies  
Chemical technologies

Biomass processing is being developed so that the nutrients they contain can be efficiently utilised and transported to where they are needed.

**Biomass processing is not always needed.**  
For example, manure can be used in agriculture as it is.

# Policy instruments are needed to promote nutrient recycling



**To achieve progress in nutrient recycling, policy instruments need to form a coherent entity.**