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recovers nature's essentials

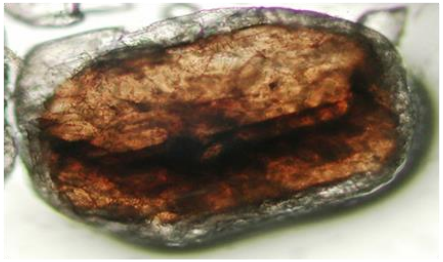
Struviet als Circulaire Meststof:

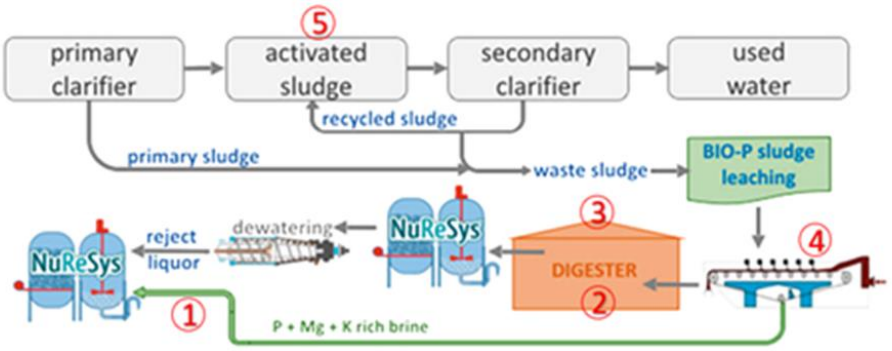
Voorloper / Uitdagingen & Opportuniteiten

Technische: Struviet Technologie

NH4MgPO4•6H2O Slecht water oplosbaar (pH > 7,0 - 8,5)
Dichthedi 1,7
Kristal Structuur

NH4-N PO4-P Mg^{2+} pH gedreven





1. Phosphorus return load
2. Pipe clogging / scaling issues
3. Struvite grit accumulation
4. Dewatering issues Bio-P
5. Stabilizing Bio-P process

Meststof eigenschappen goed gedocumenteerd en gekend
Eveneens goed Vlamvertrager
Meest Voorkomend NH4MgPO4.6H2O Minder gekend (groot potentieel) KMgPO4.6H2O

https://www.phosphorusplatform.eu/links-and-resources/p-facts

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Bio-Stru®

Sustainable Circular Fertilizer

Struviet als Alternatieve Meststof

- Minerale Meststoffen = Hoge Milieu Impact

  Geen P mijnen in EU
  Fosfor = kritische materialen Lijst EU

- Kwaliteit afhankelijk type Mg-zout

- Struviet “goede meststof eigenschappen” maar “sechte” meststof

$MgNH_4PO_4.6H_2O$	**5,7% N**	**12,6% P**	**10% Mg**	**0% K**
$MgKPO_4.6H_2O$	**0% N**	**11,4% P**	**8,7% Mg**	**17,7% K**

Lage zoutstress

- Recent onderzoek = struviet versus mineraal = equivalent
- Verschil = traagwerkend = beduidend minder 

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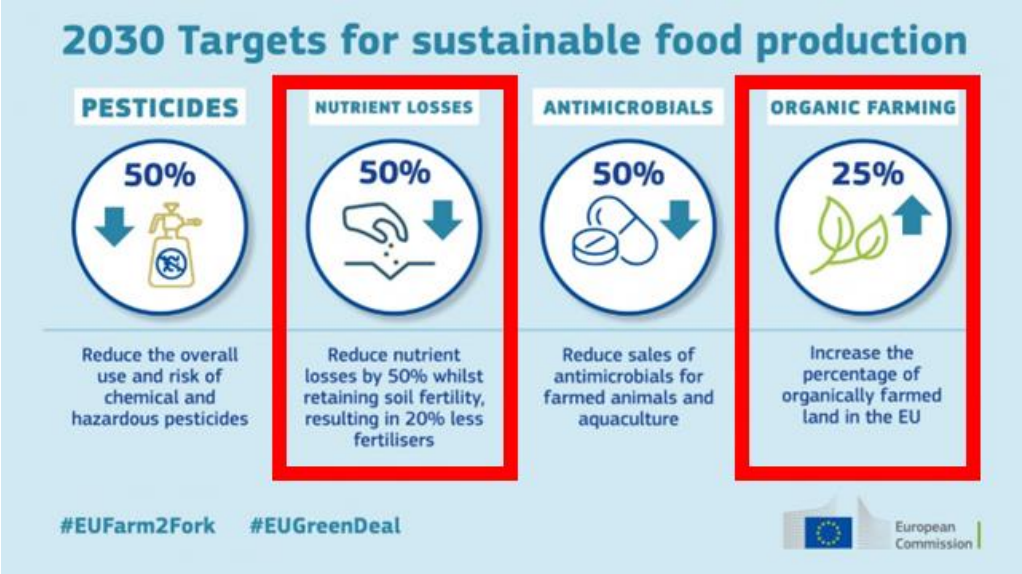
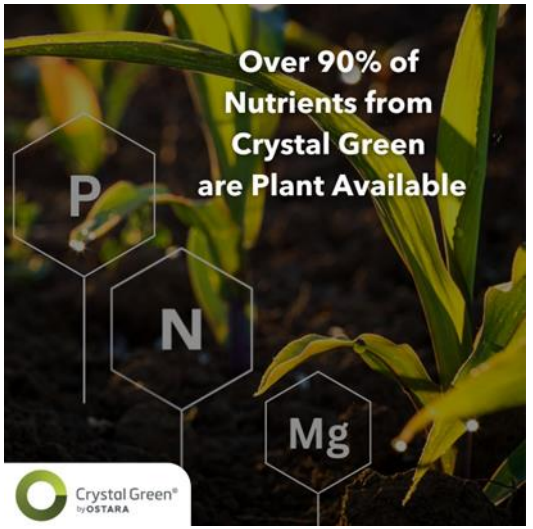
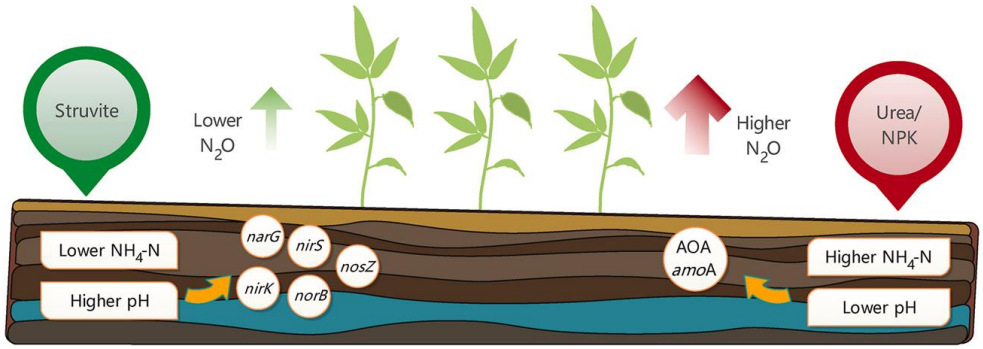




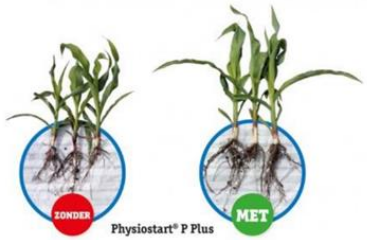
Abstract

Nitrous oxide (N_2O) is an effective ozone-depleting substance and an important greenhouse gas in the atmosphere. Fertilization is a major factor that dictates agricultural N_2O emissions. In this work, as opposed to the commonly-seen highly-soluble nitrogen (N) fertilizers, the feasibility of using struvite as a slow-releasing N-fertilizer and its mechanism for mitigating N_2O emissions were investigated. During the 149-d field cultivation of water spinach (Ipomoea Aquatica Forsk), struvite exhibited comparable crop yields, with a 40.8–58.1% N_2O reduction compared with commercial fertilizers. In addition, struvite fertilization increased soil bacterial diversity and denitrification genes levels (*narG*, *nirS*, *nirK*, *norB* and *nosZ*) effectively, but decreased nitrification genes contents (*amoA*). By conducting partial least-square path modeling, it was found that the use of struvite would satisfy the soil N control and pH regulation, which altered N-



https://www.sciencedirect.com/science/article/abs/pii/S0301479722027165

Phyto-start (Timac)



SOEPENBERG since 1954

How to turn Struvite into a Fertilizer Product

Pelletizer

Granulator

Slow-release fertiliser

- Can be used as a precision fertilizer and in organic farming:

SOEPENBERG since 1954

Struvite is a Controlled Release Fertilizer

- Roots „seek“ for nutrients in soils (this is true for N, P).
- Roots concentrate around the struvite pellet.
- By acidification, the roots solubilize the struvite and take nutrients up efficiently.

Struvite pellet after 4 months

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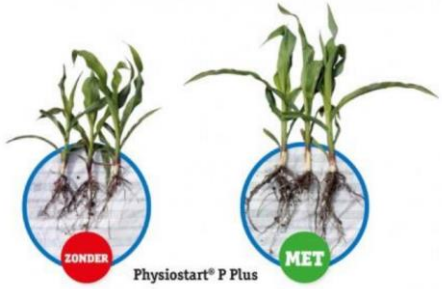
Struvite as an Alternative Fertilizer

- Root induced organic acid release
  Nitrification by soil microbiota

https://crystalgreen.com/

- Phyto-start (Timac)



- Need for Market-pull product

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Struvite as a ‘feed material’

- Further processing of struvite can add value.

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How to turn Struvite into a Fertilizer Product

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Wetgeving 2019/1009 - EU Richtlijn

An EU fertiliser product

Struviet

Voorwaarden vaste minerale macronutrient meststof (Annex I)

PFC 1(C)(I)(a)(ii):

Minimum concentrations*

- 3 % of total nitrogen (N),
- 3 % of total phosphorus pentoxide (P_2O_5),
- 3 % of total potassium oxide (K_2O),
- 1,5% of total magnesium oxide (MgO),
- 1,5 % by mass of total calcium oxide (CaO),
- 1,5 % by mass of total sulphur trioxide (SO_3), or
- 1% of total sodium oxide (Na_2O).

Total sodium oxide (Na_2O) < 40 %.
The sum of all declared macronutrient contents shall be at least 18 % by mass.

Voorwaarden CMC12: geprecipiteerde fosfaten (Annex II)

CMC 12

Struviet uit afvalwater is toegestaan (zowel municipaal als industrieel)

The precipitated phosphate salts shall contain:

- phosphorus pentoxide (P_2O_5) > 16 % of the dry matter content;
- Organic carbon (C_{org})< 3 % of the dry matter content;
- <3 g/kg dry matter of macroscopic impurities above 2 mm (organic matter, glass, stones, metal and plastics;
- <5 g/kg dry matter of the sum of the macroscopic impurities referred.

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R2086

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Wetgeving / CE Markering !!

- Precipitatie in afzonderlijke reactor.
- Pathogenen

Micro-organisms to be tested	Sampling plans			Limit
	n	c	m	M
Salmonella spp.	5	0	0	Absence in 25 g or 25 ml
Escherichia coli or *Enterococcaceae*	5	5	0	1 000 in 1 g or 1 ml
Clostridium perfringens	5	5	0	100 CFU in 1 g or 1 ml
Ascaris sp. viable eggs	5	0	0	Absence in 25 g or 25 ml

- Droge stof meting bij 40°C
- Zware metalen

Regulated metals (mg/kg)*	EU Fertilizer limit
Zn	1500
Cu	600
Ni	100
Cr VI	2
Cd	60
Pb	120
Hg	1
As (inorg.)	40

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R2086

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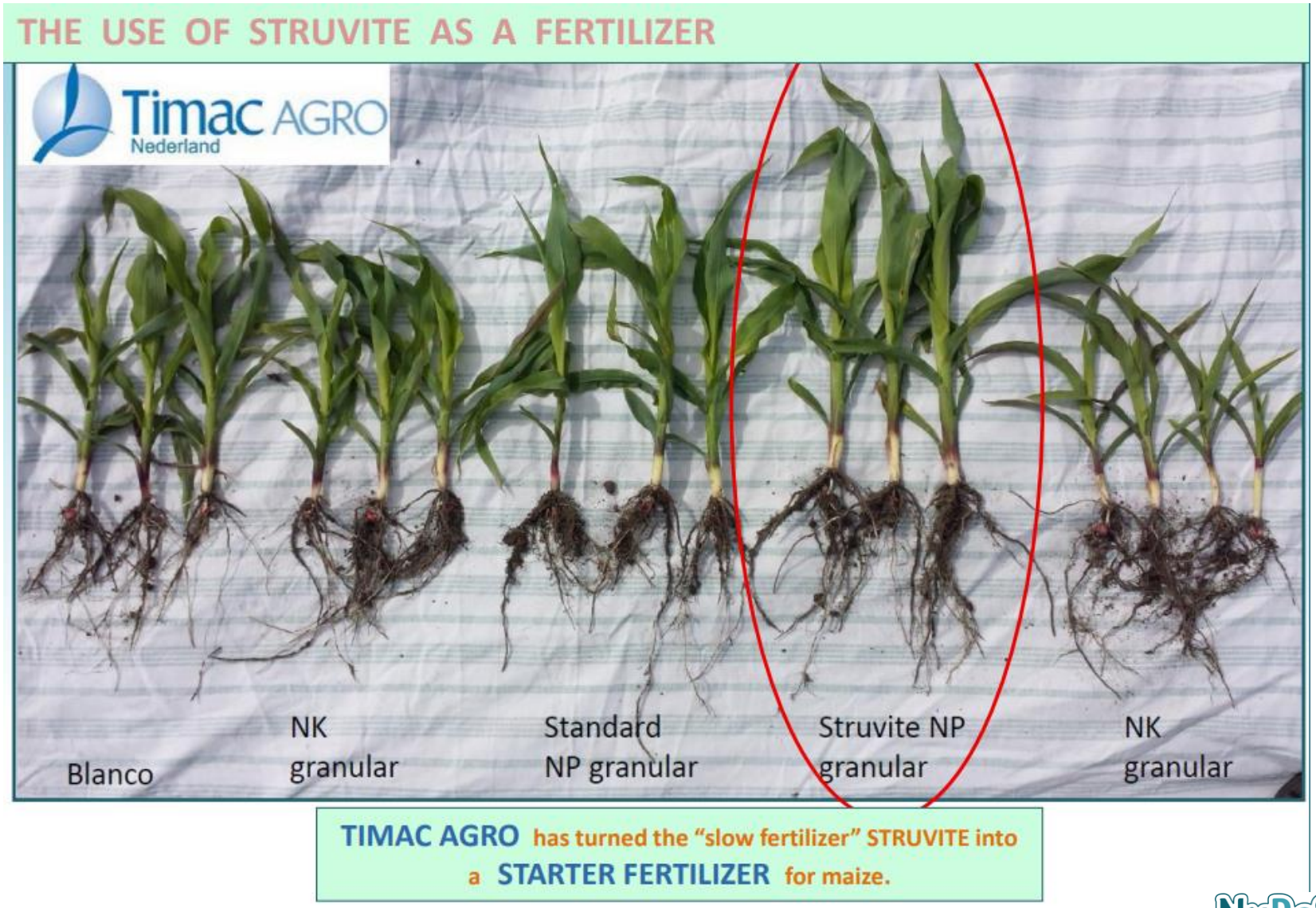
Bio-Stru veldproeven -Mais



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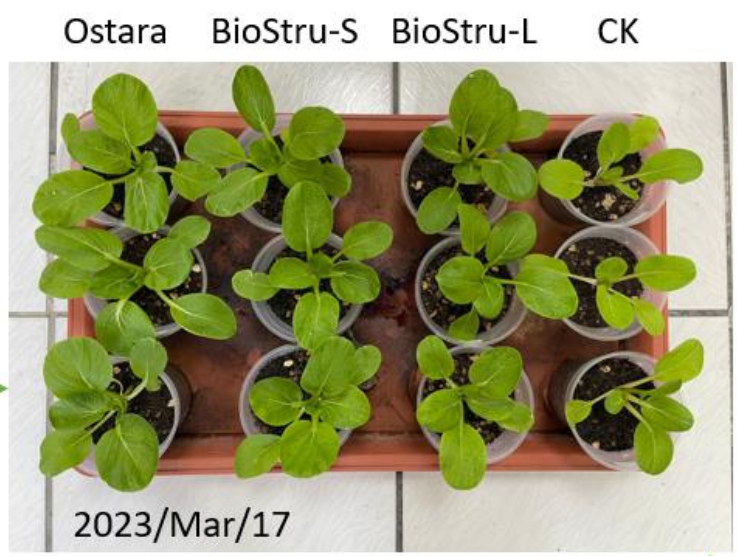
Struviet testen – Singapore



- Ostara was purchase from the dealer shop in Taiwan
- Use same gram of Ostara, BioStru-S and –L (2 different particle size) and directly mix with pak choy roots.
- CK, water + foliar fertilizer 14-15-10 1 time on 10 Mar.
- We test 2 weeks, there is no harmful to roots.

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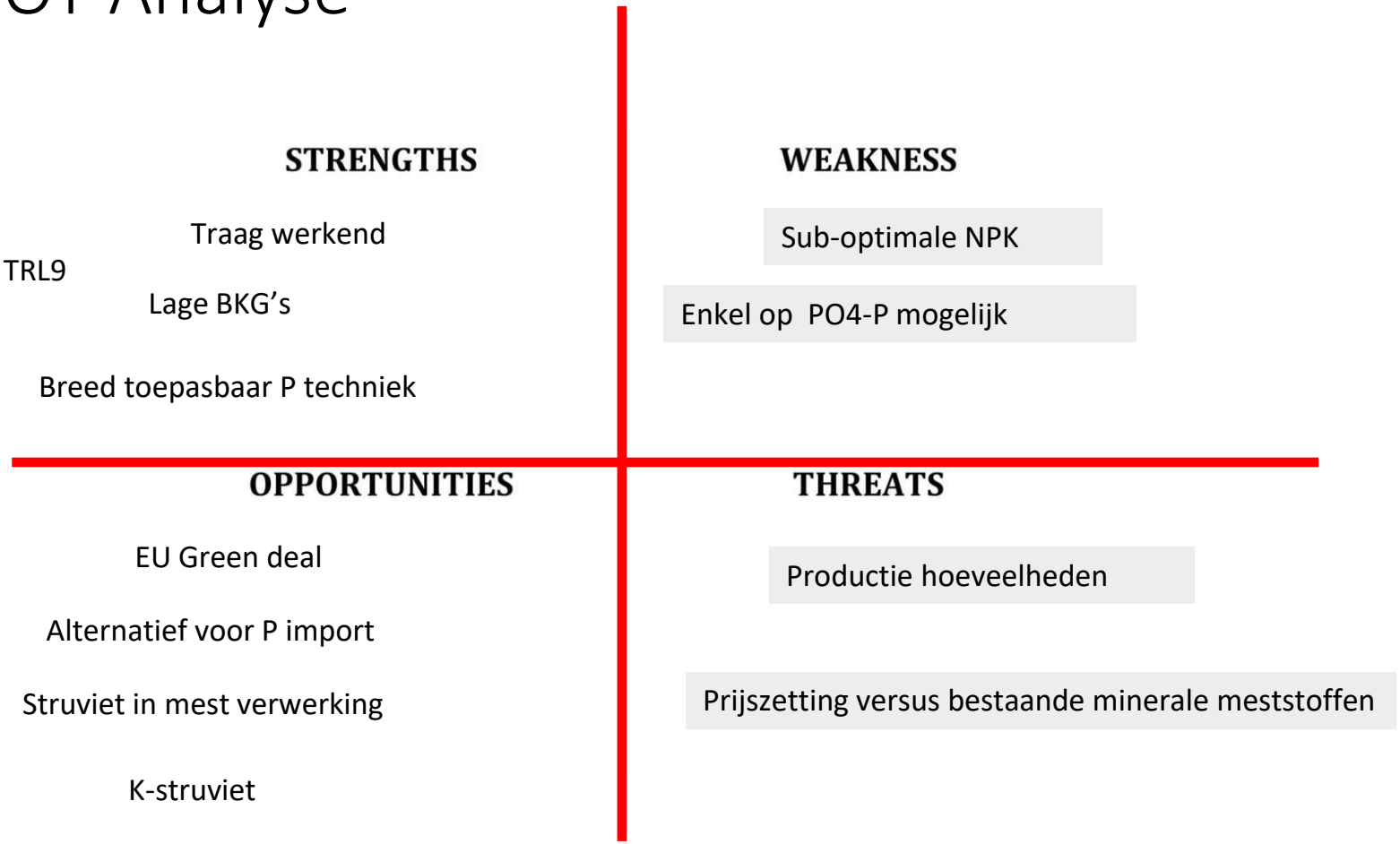
SWOT Analyse




NuReSys®
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