

# Langetermijn effecten fosfaatbemesting

## *Bodem en Gewas*

Wim van Dijk & Phillip Ehlert



# Inhoud

## ■ Gedrag fosfaat in de bodem

- Fosfaatfracties en bepalingsmethoden
- Verloop bodemtoestand i.r.t. bemesting/overschot (lange termijn veldonderzoek)
- Conclusies

## ■ Gewas

- Marktbare opbrengst
- Conclusies

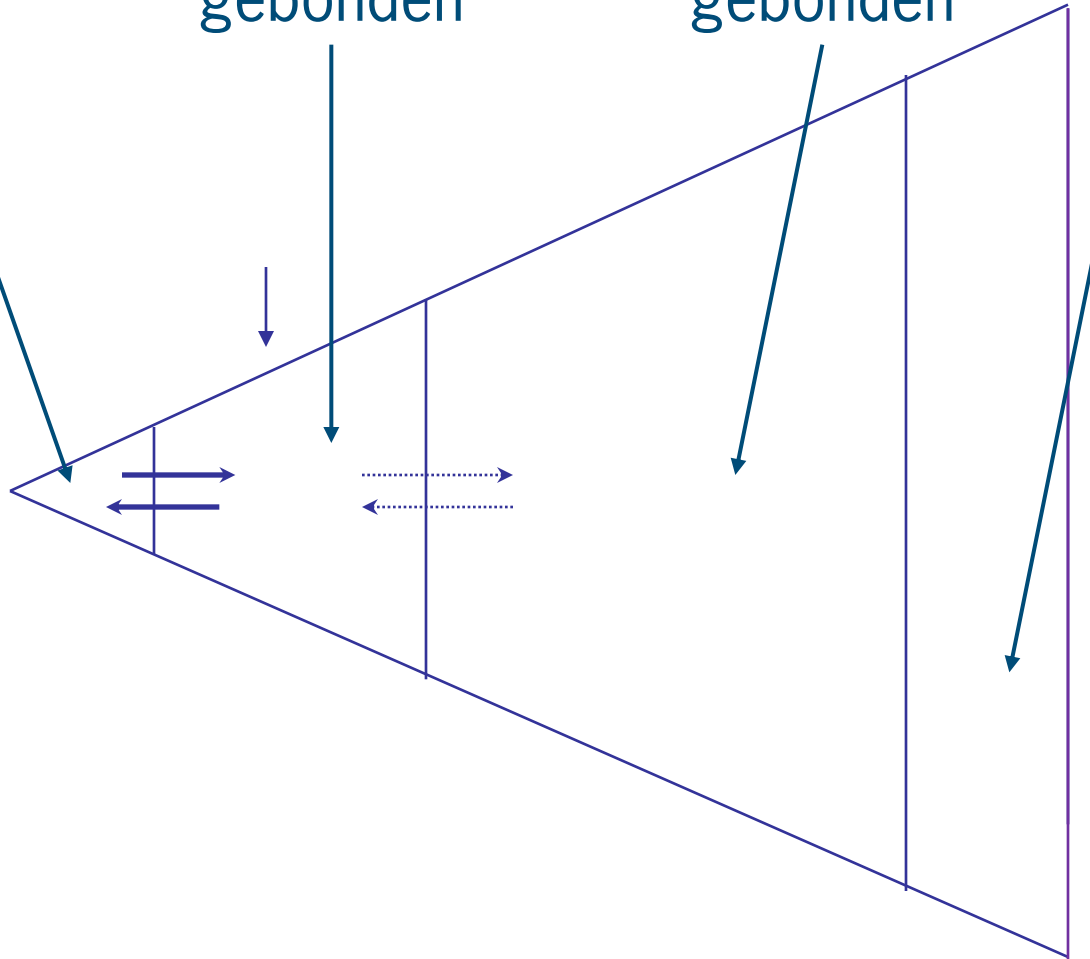
# Fosfaatfracties en bepalingsmethoden

Bodemoplossing

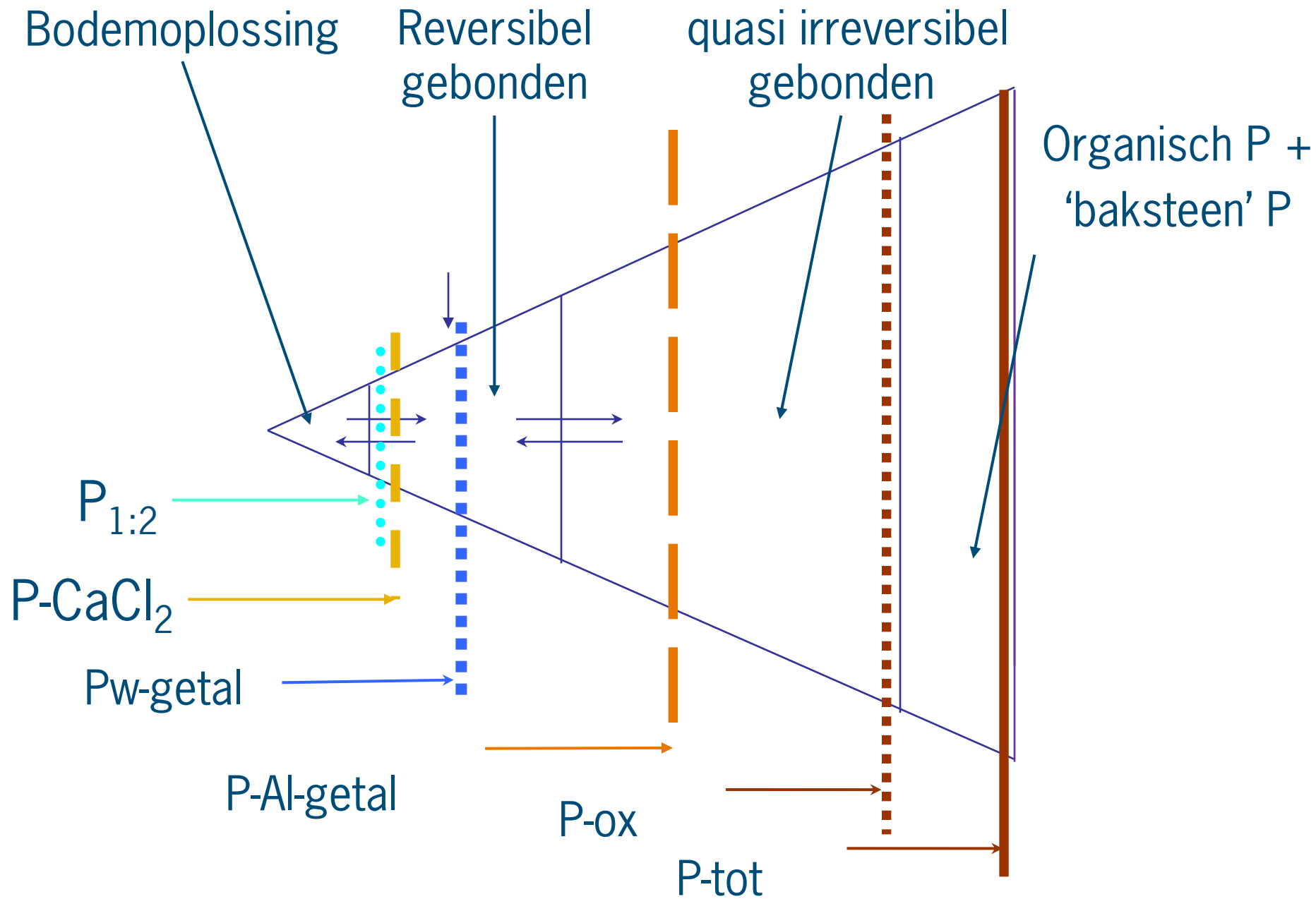
Reversibel  
gebonden

quasi irreversibel  
gebonden

Organisch P +  
'baksteen' P



# Fosfaatfracties en bepalingsmethoden



# Lange termijn onderzoek

## ■ Veldproeven

- Zeeklei (Lelystad en Marknesse) en zand (Wijster)
- Langjarige toediening fosfaatgiften

## ■ Bedrijfssysteemonderzoek

- Klei: Nagele, Westmaas)
- Zand: Vredepeel, De Marke, Meterik
- Effect fosfaatevenwichtsbemesting

# Fosfaatbemesting P1 t/m P4 (kg P<sub>2</sub>O<sub>5</sub>/ha/jaar)

## Lelystad, 1987-....

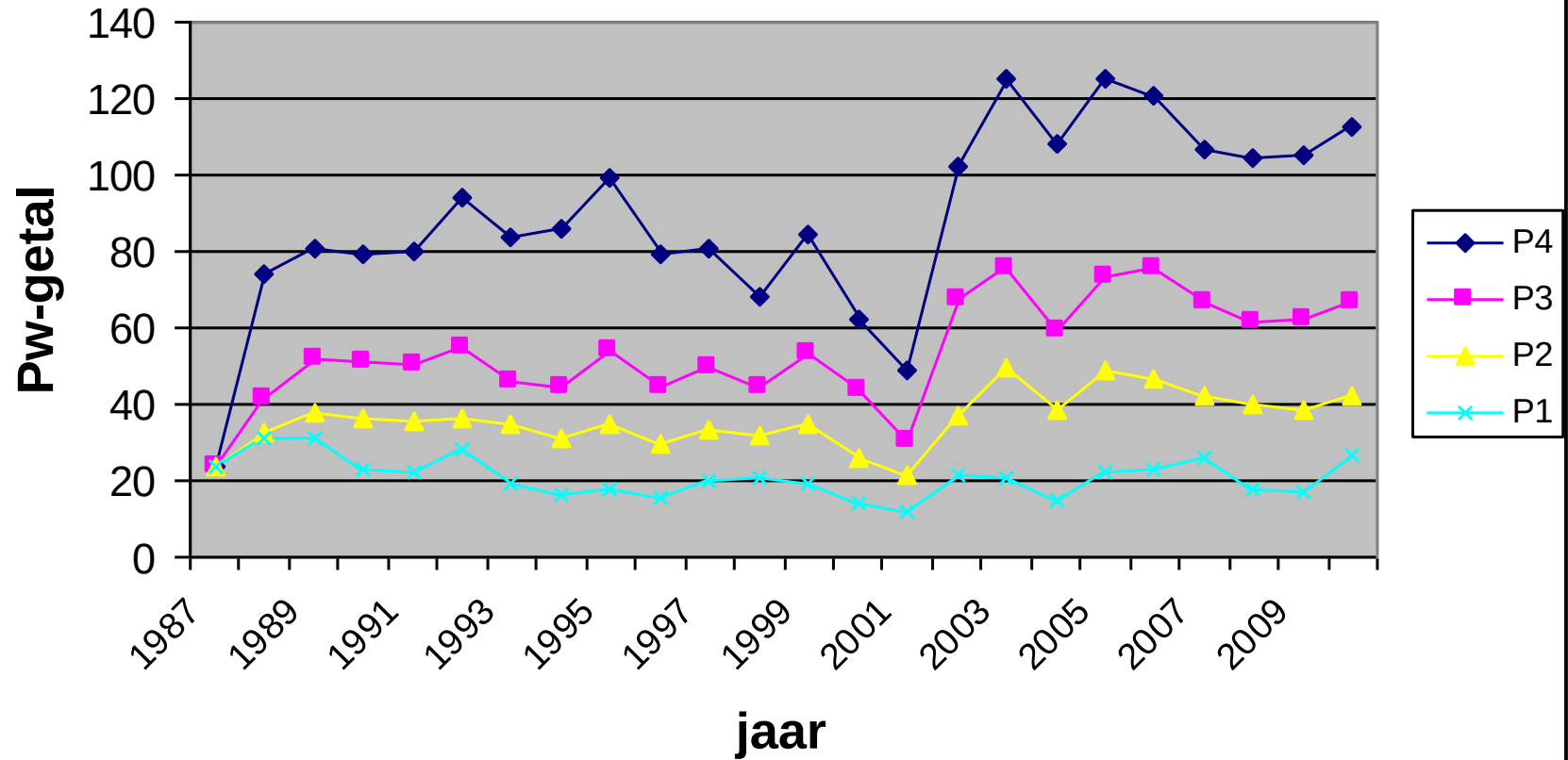
|                      | P1         | P2         | P3         | P4          |
|----------------------|------------|------------|------------|-------------|
| <i>1987-1989</i>     | <i>45</i>  | <i>125</i> | <i>255</i> | <i>475</i>  |
|                      |            |            |            |             |
| <i>1990-2004</i>     | <i>0</i>   | <i>70</i>  | <i>140</i> | <i>280</i>  |
| <i>P-ovs (kg/ha)</i> | <i>-35</i> | <i>+25</i> | <i>+90</i> | <i>+215</i> |

# Fosfaatbemesting P1 t/m P4 (kg P<sub>2</sub>O<sub>5</sub>/ha/jaar)

Lelystad, 1987-....

|                      | P1         | P2         | P3         | P4          |
|----------------------|------------|------------|------------|-------------|
| <i>1987-1989</i>     | <i>45</i>  | <i>125</i> | <i>255</i> | <i>475</i>  |
|                      |            |            |            |             |
| <i>1990-2004</i>     | <i>0</i>   | <i>70</i>  | <i>140</i> | <i>280</i>  |
| <i>P-ovs (kg/ha)</i> | <i>-35</i> | <i>+25</i> | <i>+90</i> | <i>+215</i> |
|                      |            |            |            |             |
| <i>2005-2010</i>     | <i>0</i>   | <i>0</i>   | <i>0</i>   | <i>0</i>    |
|                      | <i>70</i>  | <i>70</i>  | <i>140</i> | <i>280</i>  |

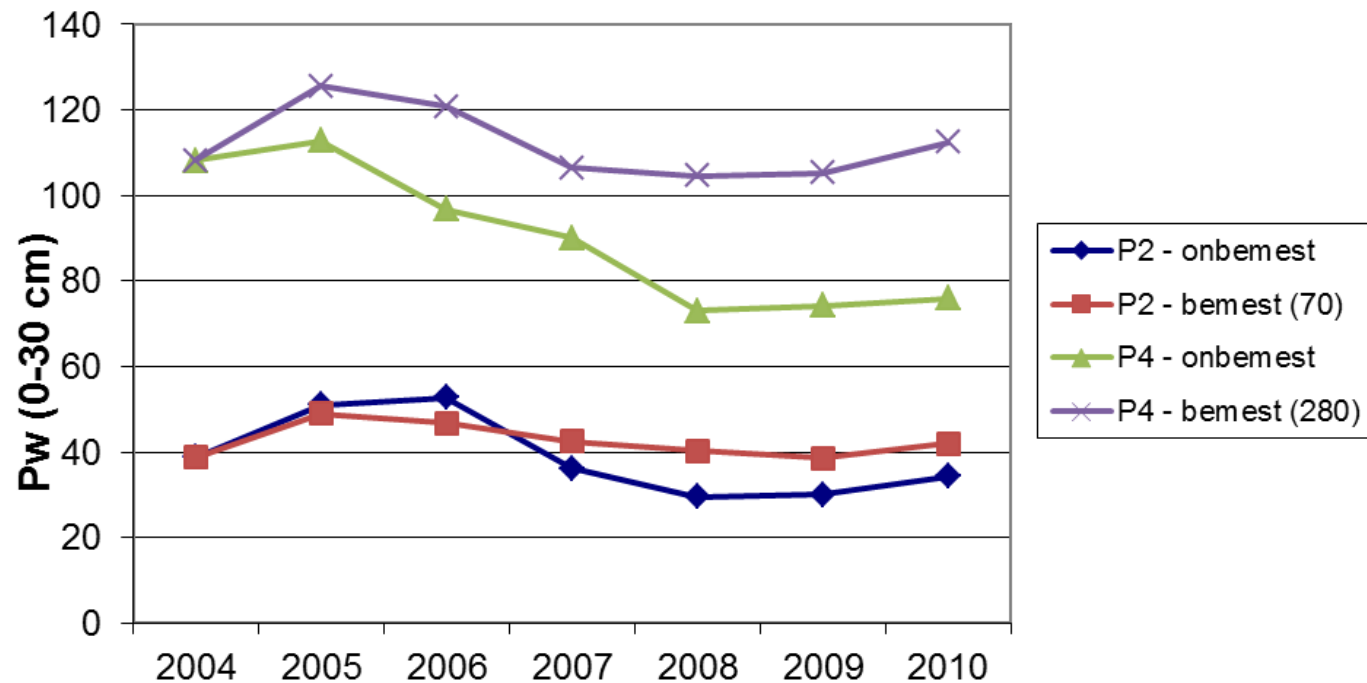
# Verloop Pw (0-30 cm), Lelystad





# Verloop Pw (0-30 cm), onbemest en bemest

## Lelystad

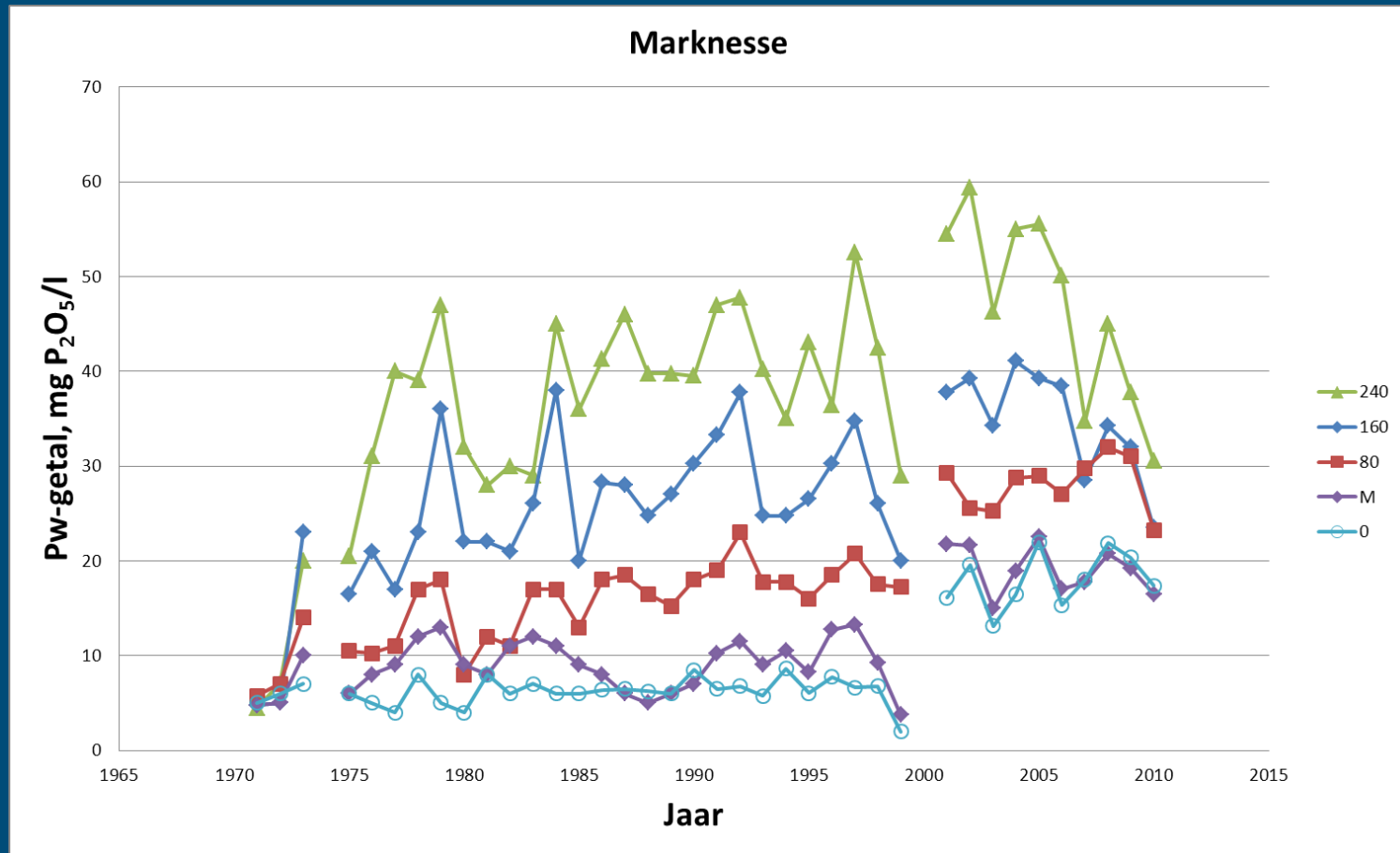


# Fosfaatbemesting (kg P<sub>2</sub>O<sub>5</sub>/ha/jaar)

Marknesse, 1971-.....

|                      | P1         | P2        | P3         | P4          | P5          |
|----------------------|------------|-----------|------------|-------------|-------------|
| 1971-1989            | 0          |           | 80         | 160         | 240         |
|                      |            |           |            |             |             |
| 1990-2010            | 0          | M         | 80         | 160         | 240         |
|                      |            |           |            |             |             |
| <i>P-ovs (kg/ha)</i> | <i>-49</i> | <i>-6</i> | <i>+25</i> | <i>+103</i> | <i>+181</i> |

# Verloop Pw (0-30 cm), Marknesse

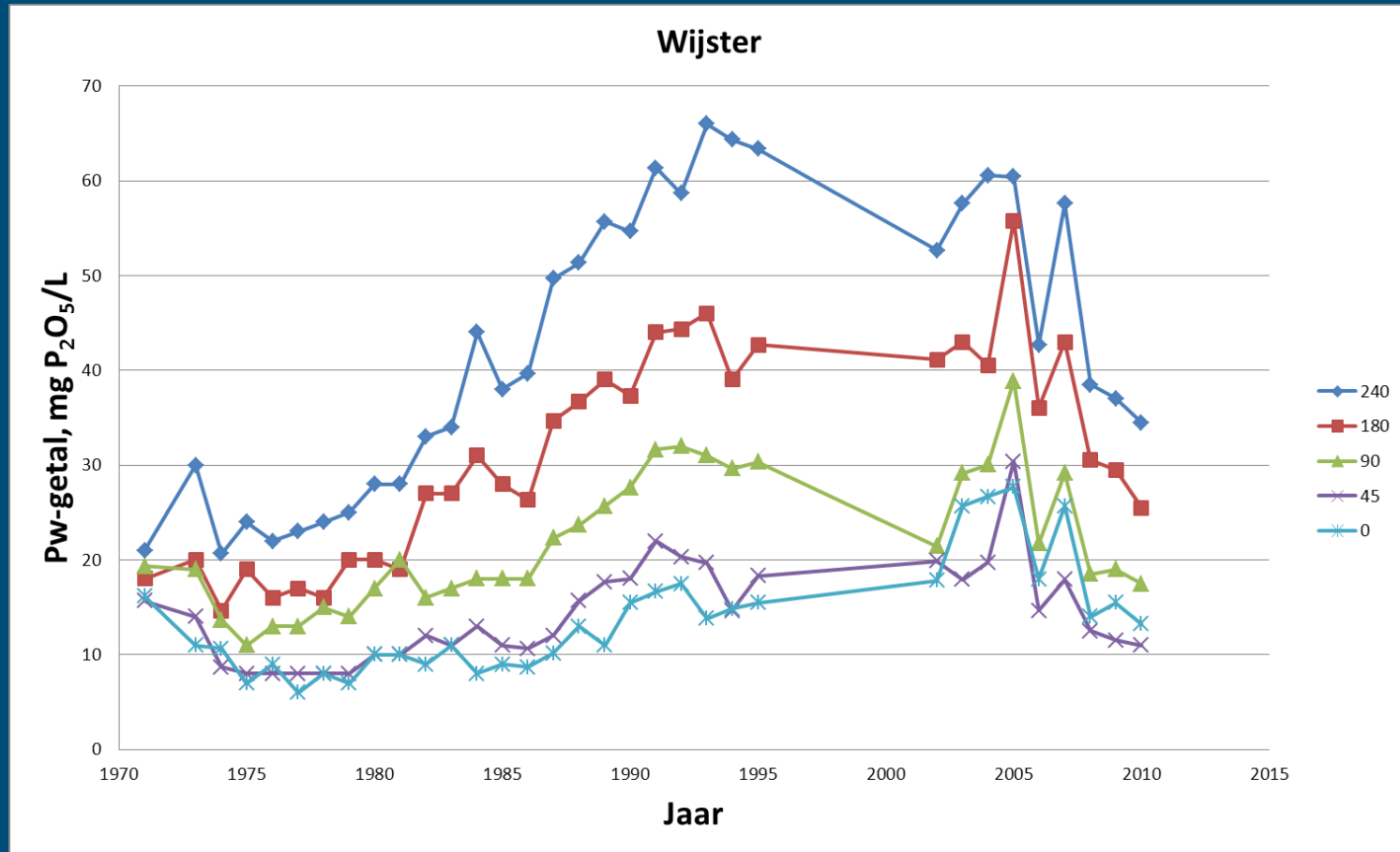


# Fosfaatbemesting (kg $P_2O_5$ /ha/jaar)

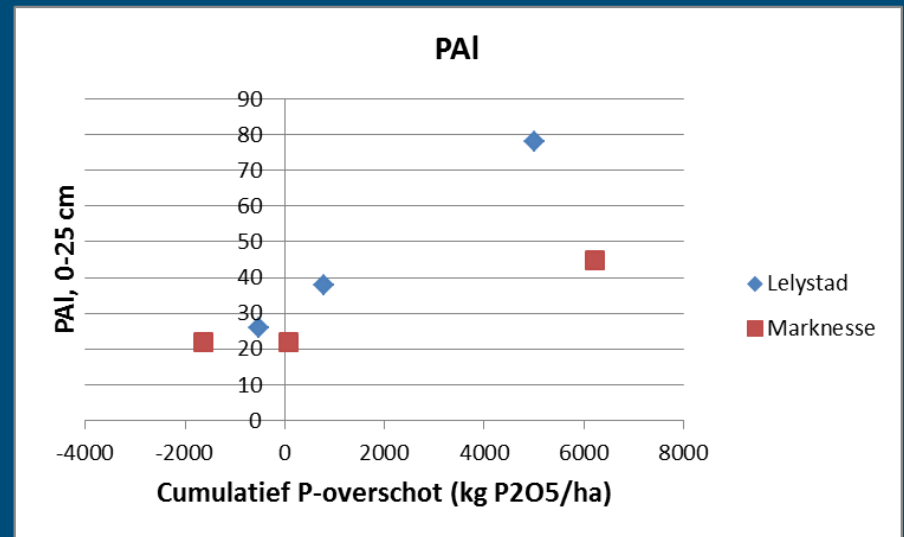
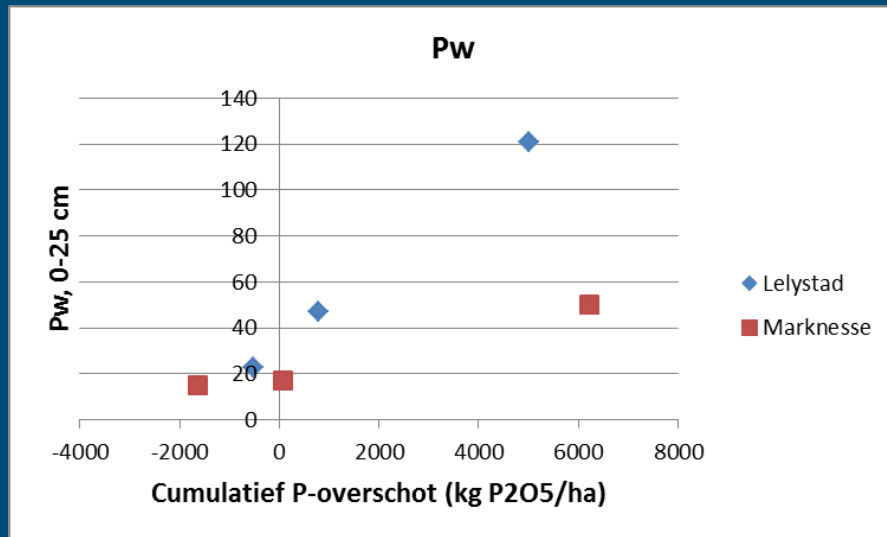
Wijster, 1972-.....

|                      | P1  | P2 | P3  | P4   | P5   |
|----------------------|-----|----|-----|------|------|
| 1972-2010            | 0   | 45 | 90  | 180  | 240  |
| <i>P-ovs (kg/ha)</i> | -39 | +3 | +43 | +130 | +184 |

# Verloop Pw (0-30 cm), Wijster

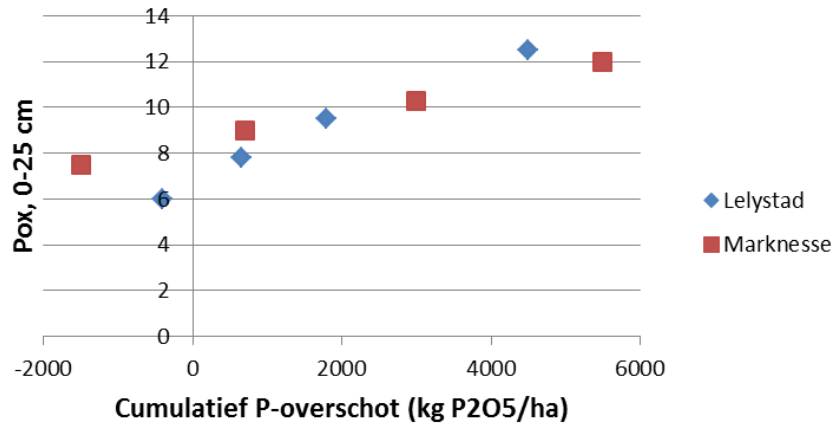


# Cumulatief P-overschot versus Pw en PAI

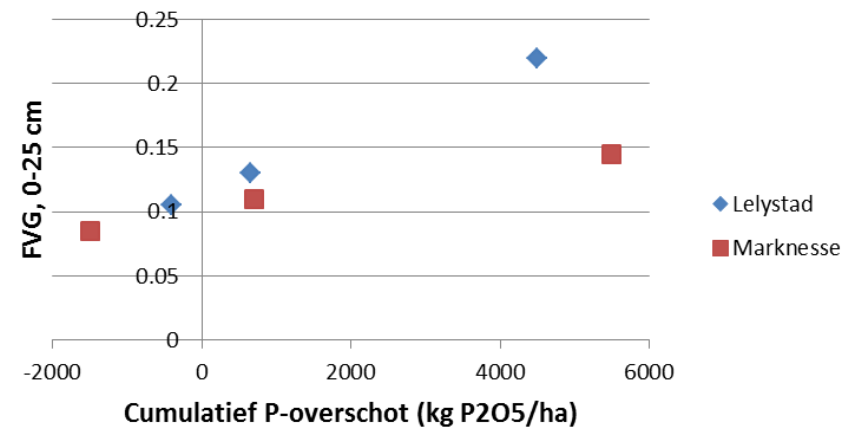


# Cumulatief P-overschot versus Pox en FVG

Pox

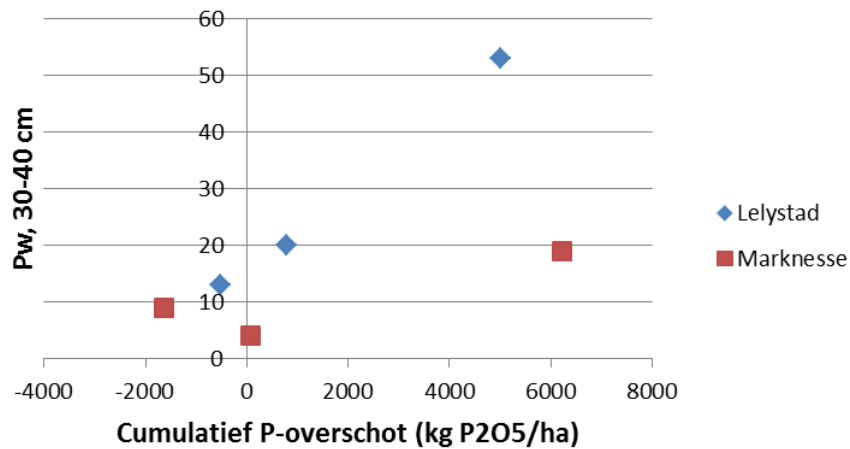


FVG

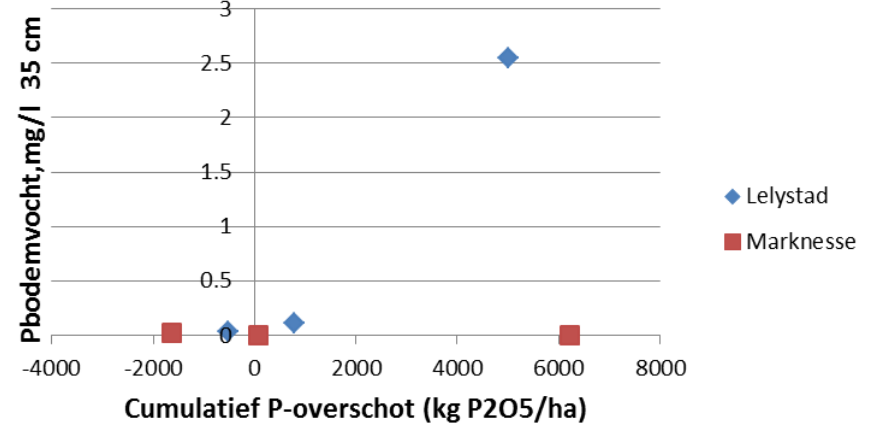


# Cumulatief P-overschot versus Pw 30-40 cm en Pbodemvocht 25 cm

Pw, 30-40 cm

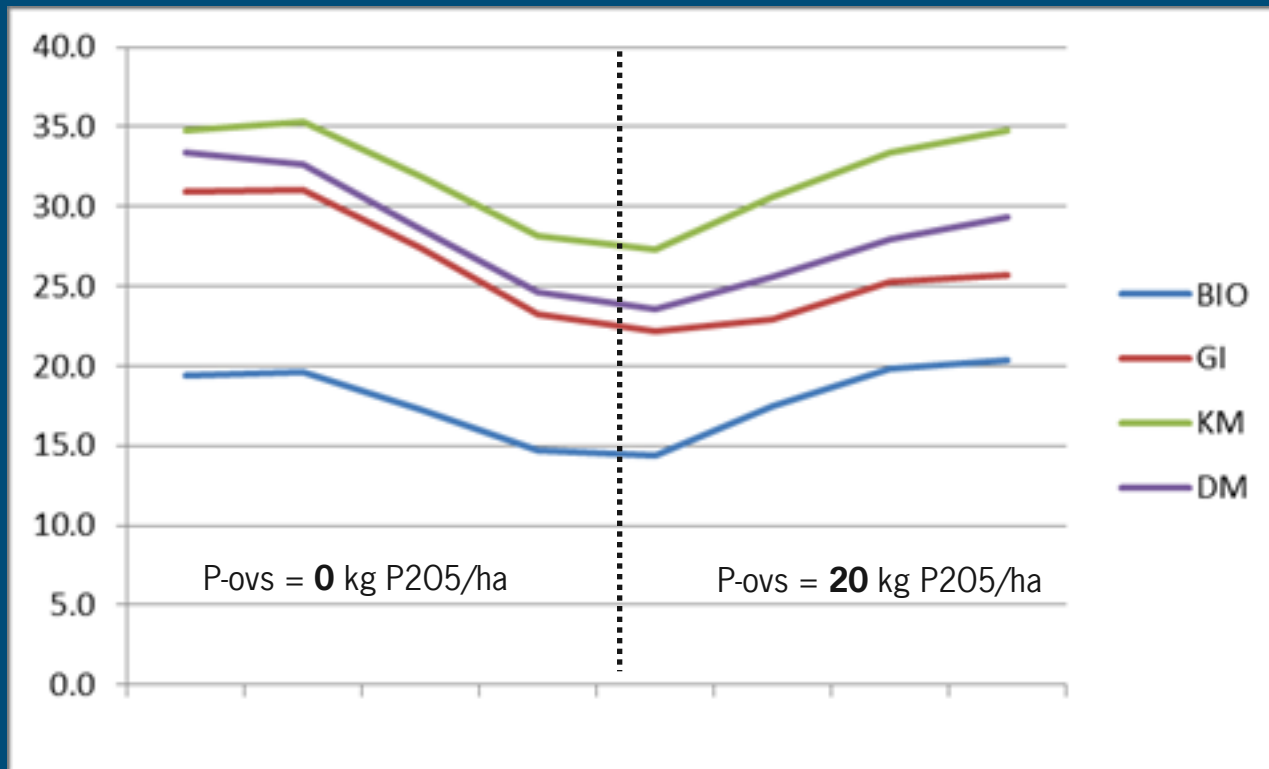


P bodemvocht, 35 cm

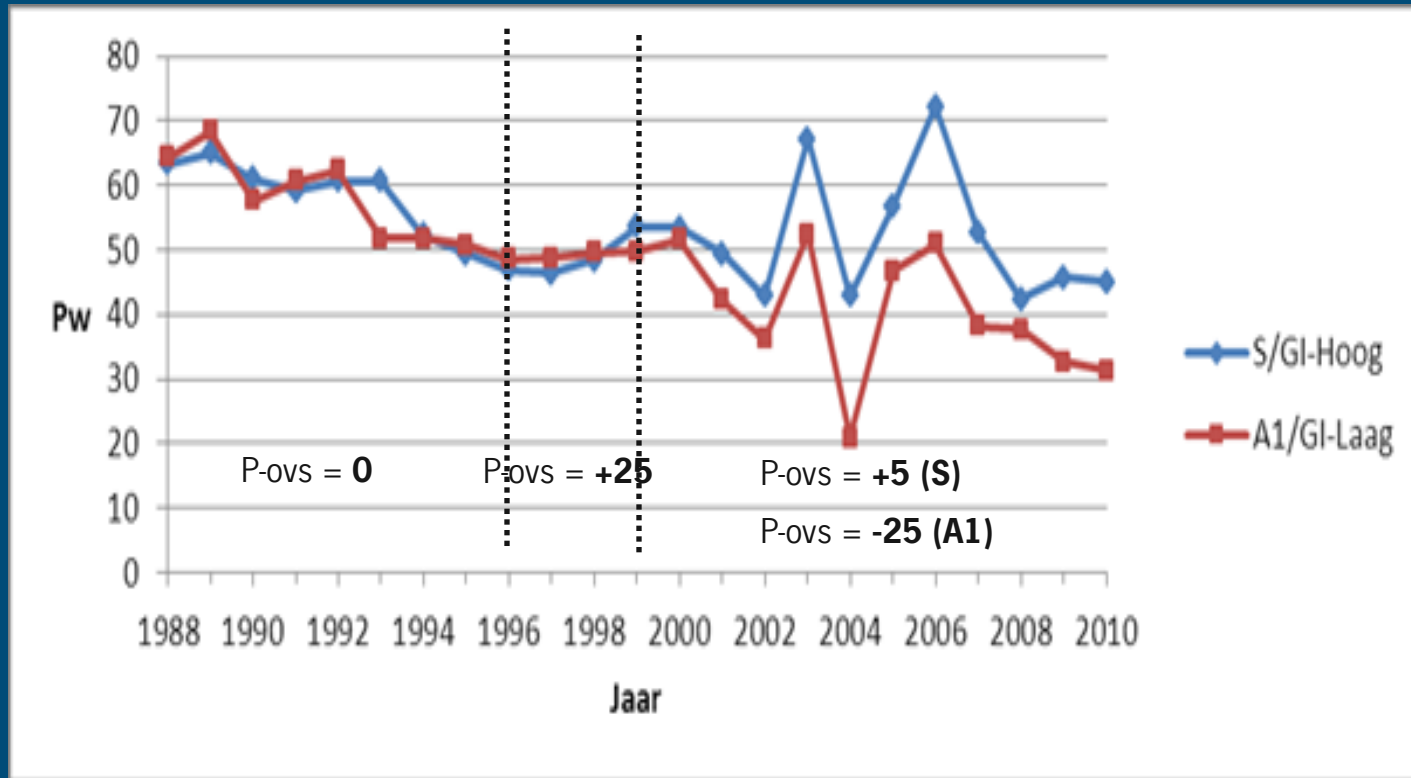




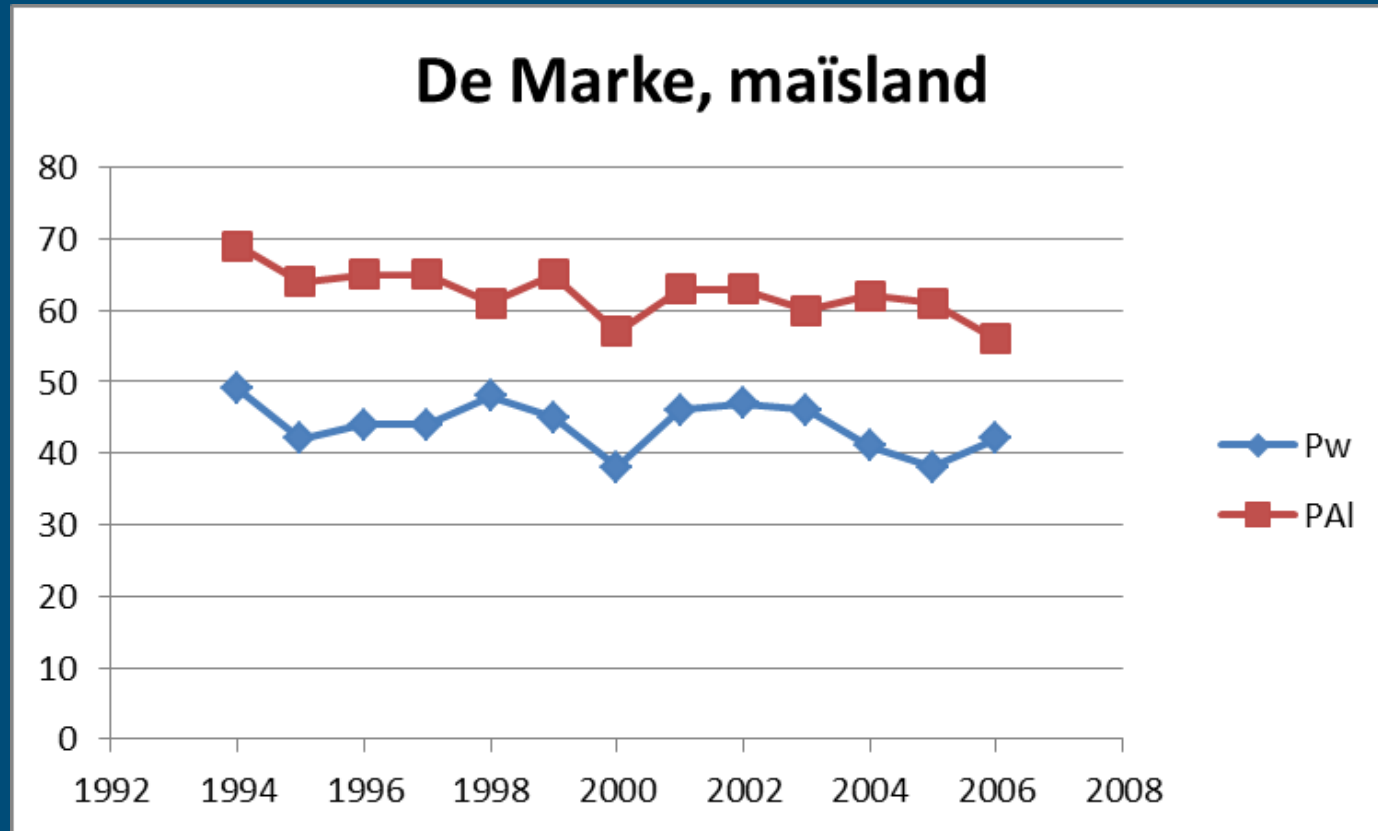
# Verloop Pw bouwvoor, Nagele OBS



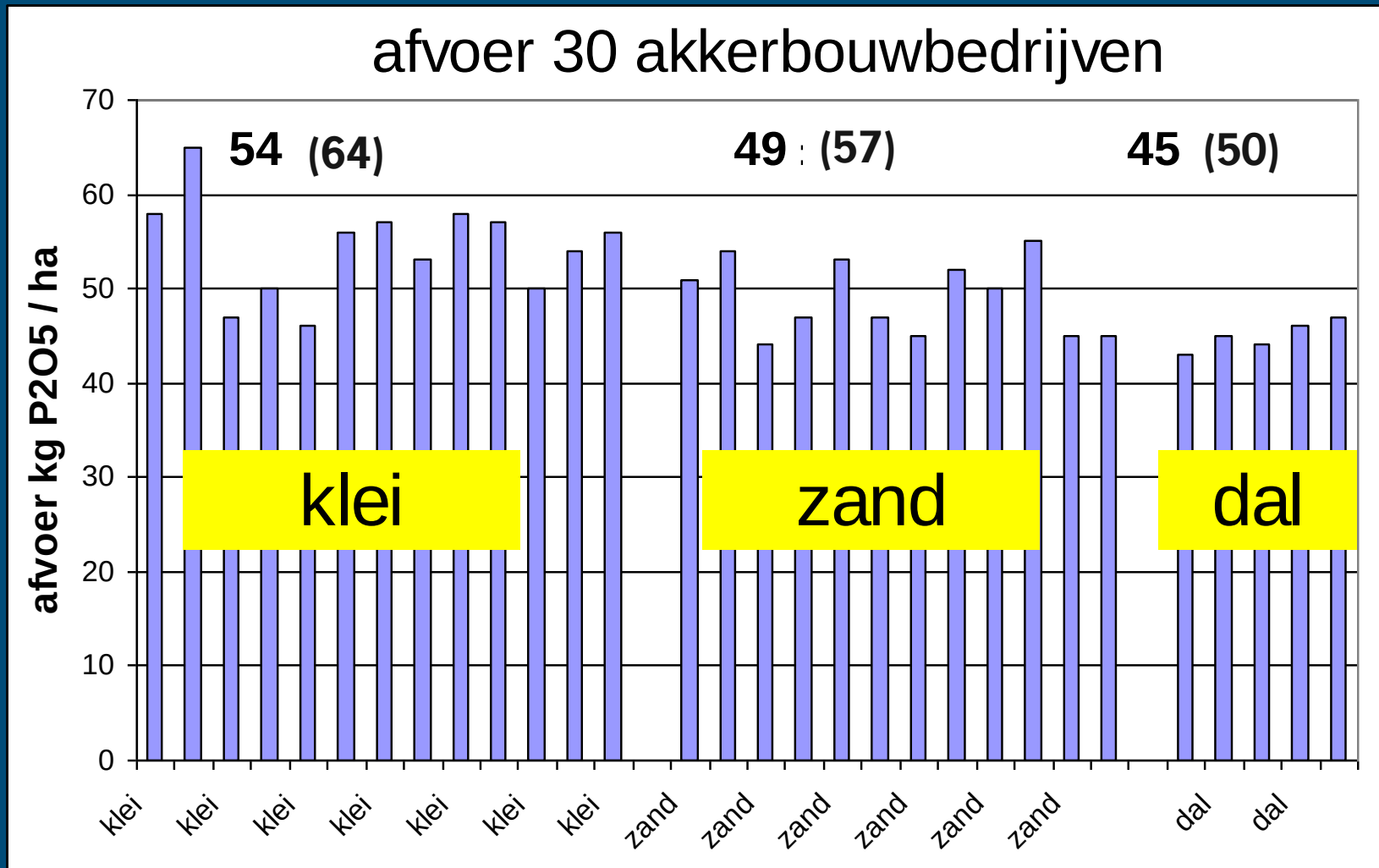
# Verloop Pw bouwvoor, Vredepeel



# Verloop Pw/PAL, De Marke



# Fosfaatafvoer **bedrijf**



# Fosfaatgebruiksnormen (kg P<sub>2</sub>O<sub>5</sub>/ha)

|      | Laag<br>Pw < 25<br>(repar) | Laag<br>Pw < 36 | Neutraal<br>36 ≤ Pw ≤ 55 | Hoog<br>Pw > 55 |
|------|----------------------------|-----------------|--------------------------|-----------------|
| 2013 | 120                        | 85              | 65                       | 55              |
|      |                            |                 |                          |                 |

# Conclusies bodem

- Gedrag fosfaat loopt sterk uiteen tussen bodems
- Bij strikte evenwichtsbemesting
  - Bij hoge uitgangstoestand daling fosfaattoestand
  - Stabilisatie bij lagere toestand (Pw 20-30)
- Mestbeleid 2013  $\neq$  evenwichtsbemesting

# Gewasopbrengst (rel), Lelystad

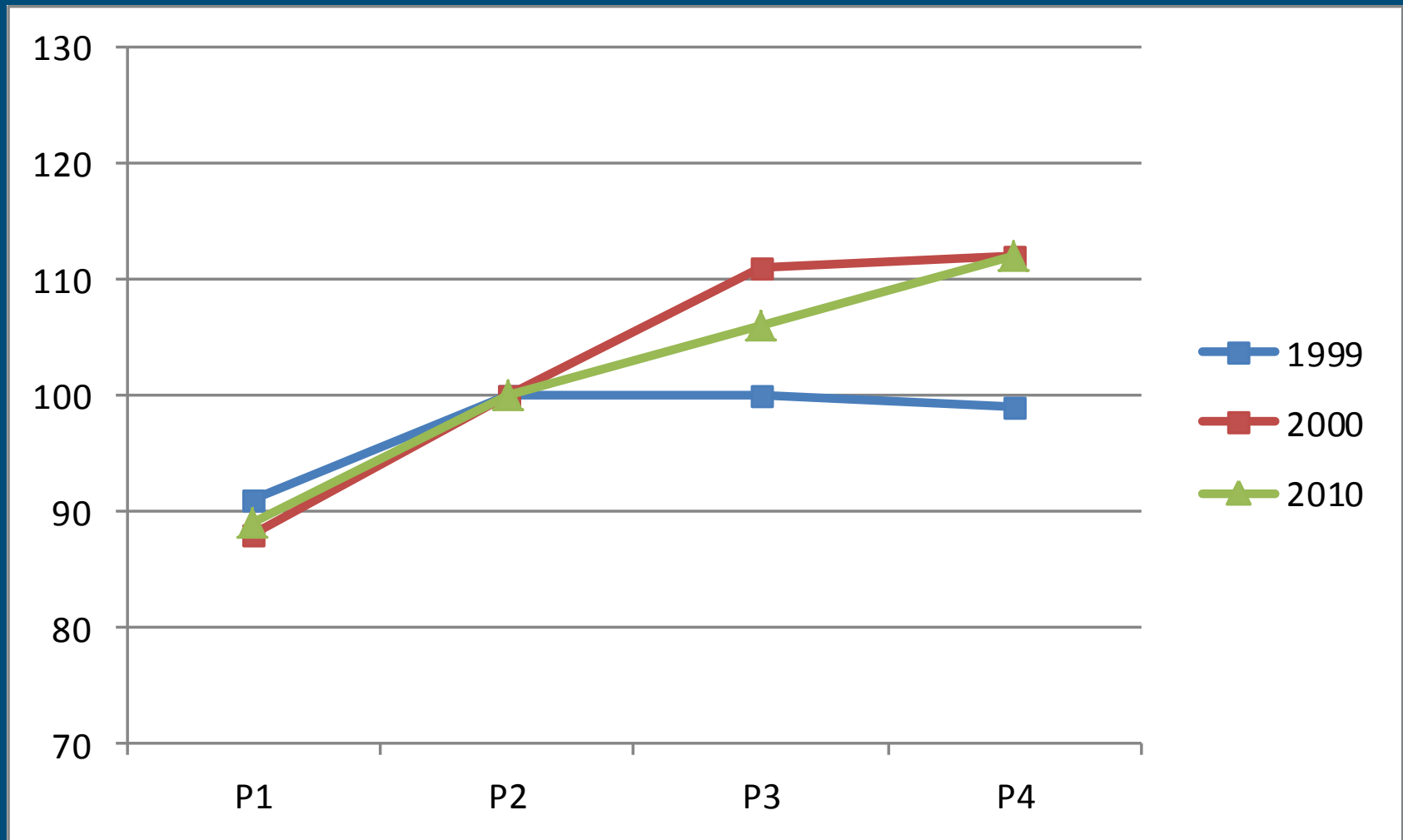
| Gewasgroep<br>Advies | Beproefde gewassen | Fosfaatbemesting<br>(kg P <sub>2</sub> O <sub>5</sub> /ha/jaar) |      |      |      |
|----------------------|--------------------|-----------------------------------------------------------------|------|------|------|
|                      |                    | 0                                                               | 70   | 140  | 280  |
|                      |                    |                                                                 |      |      |      |
| Alle gewassen        |                    | 0.92                                                            | 1.00 | 1.00 | 1.03 |
|                      |                    |                                                                 |      |      |      |

# Gewasopbrengst (rel), Lelystad

| Gewasgroep<br>Advies | Beproefde gewassen                               | Fosfaatbemesting<br>(kg P <sub>2</sub> O <sub>5</sub> /ha/jaar) |      |      |      |
|----------------------|--------------------------------------------------|-----------------------------------------------------------------|------|------|------|
|                      |                                                  | 0                                                               | 70   | 140  | 280  |
|                      |                                                  |                                                                 |      |      |      |
| Alle gewassen        |                                                  | 0.92                                                            | 1.00 | 1.00 | 1.03 |
|                      |                                                  |                                                                 |      |      |      |
| GG 0                 | Sla (4)                                          | 0.91                                                            | 1.00 | 1.08 | 1.16 |
| GG 1                 | Aardappel (5), ui (2), stamslaboon (1), erwt (2) | 0.91                                                            | 1.00 | 0.99 | 1.01 |
| GG 2                 | Suikerbiet (3)                                   | 0.96                                                            | 1.00 | 0.98 | 0.98 |
| GG 3                 | Zomergerst (3), peen (3), witlof(1)              | 0.95                                                            | 1.00 | 1.01 | 1.02 |
| GG 4                 | Wintertarwe (1), prei (2), bloemkool (2)         | 0.91                                                            | 1.00 | 0.98 | 1.01 |



# Lelystad, consumptieaardappel, opbrengst (rel)

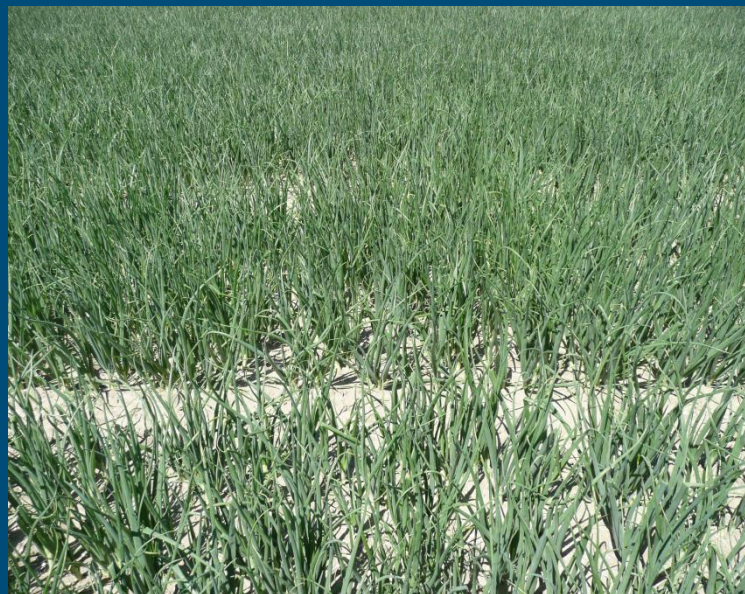


# Ontwikkeling uien juni 2008

P1



P3





# Ontwikkeling peen juli 2009



# Gewasopbrengst (rel) 2002-2007, Marknesse

| Gewasgroep<br>Advies | Beproefde gewassen | Fosfaatbemesting<br>(kg P <sub>2</sub> O <sub>5</sub> /ha/jaar) |      |      |      |      |
|----------------------|--------------------|-----------------------------------------------------------------|------|------|------|------|
|                      |                    | 0                                                               | M    | 80   | 160  | 240  |
|                      |                    |                                                                 |      |      |      |      |
| Alle gewassen        |                    | 0.96                                                            | 1.00 | 1.03 | 0.97 | 1.00 |
|                      |                    |                                                                 |      |      |      |      |

# Gewasopbrengst (rel) 2002-2007, Marknesse

| Gewasgroep<br>Advies | Beproefde gewassen      | Fosfaatbemesting<br>(kg P <sub>2</sub> O <sub>5</sub> /ha/jaar) |      |      |      |      |
|----------------------|-------------------------|-----------------------------------------------------------------|------|------|------|------|
|                      |                         | 0                                                               | M    | 80   | 160  | 240  |
|                      |                         |                                                                 |      |      |      |      |
| Alle gewassen        |                         | 0.96                                                            | 1.00 | 1.03 | 0.97 | 1.00 |
|                      |                         |                                                                 |      |      |      |      |
| GG 1                 | Aardappel (2), erwt (1) | 0.97                                                            | 1.00 | 1.05 | 0.94 | 1.03 |
| GG 2                 | Suikerbiet (1)          | 0.90                                                            | 1.00 | 1.00 | 0.99 | 0.91 |
| GG 3                 | Zomergerst (1)          | 0.98                                                            | 1.00 | 1.05 | 1.02 | 1.05 |
| GG 4                 | Zomertarwe (1)          | 0.99                                                            | 1.00 | 0.99 | 1.00 | 0.98 |

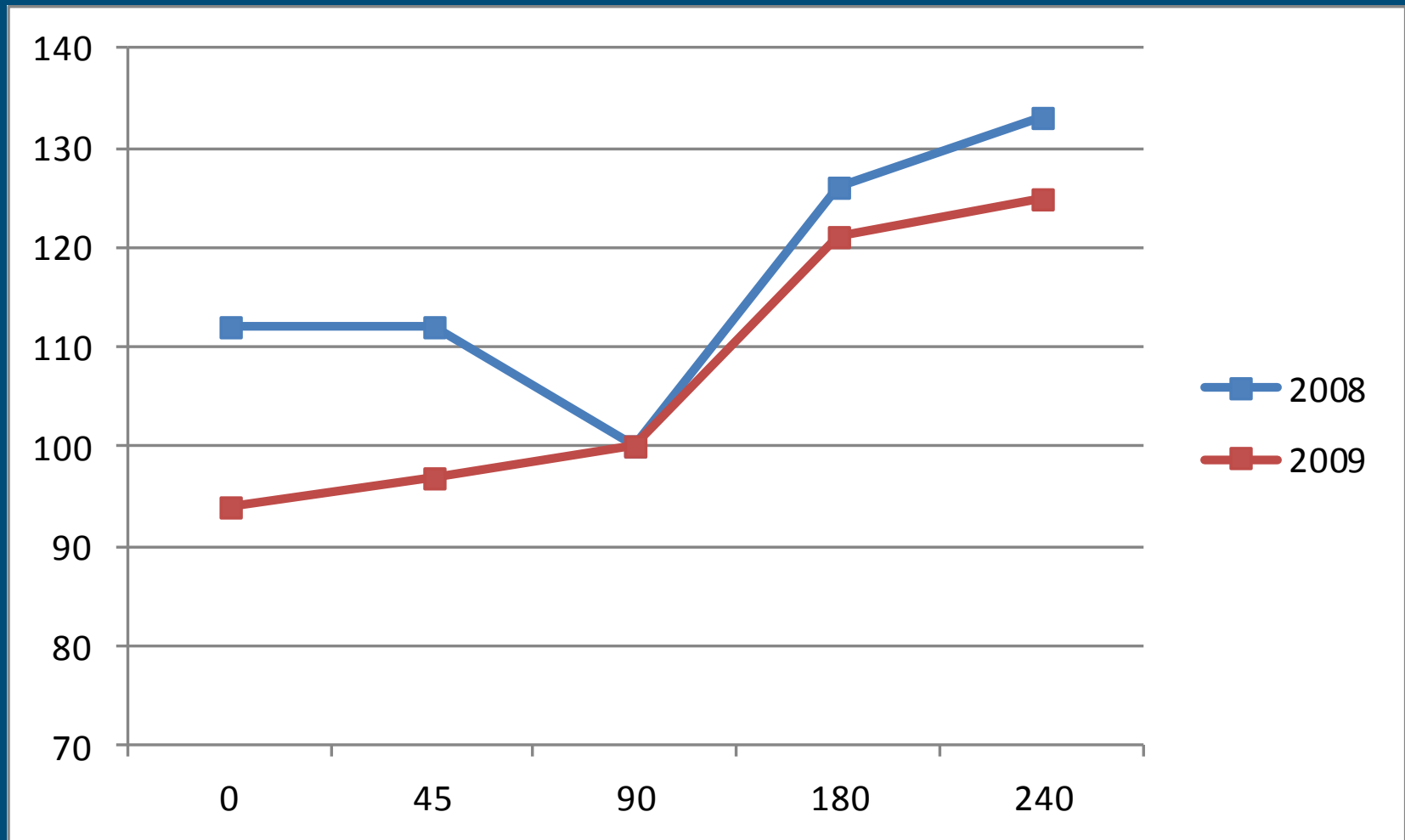
# Gewasopbrengst (rel) 1972-1996, Wijster

| Gewasgroep<br>Advies | Beproefde gewassen | Fosfaatbemesting<br>(kg P <sub>2</sub> O <sub>5</sub> /ha/jaar) |      |      |      |      |
|----------------------|--------------------|-----------------------------------------------------------------|------|------|------|------|
|                      |                    | 0                                                               | 45   | 90   | 180  | 240  |
|                      |                    |                                                                 |      |      |      |      |
| Alle gewassen        |                    | 0.96                                                            | 1.00 | 1.06 | 1.10 | 1.10 |
|                      |                    |                                                                 |      |      |      |      |

# Gewasopbrengst (rel) 1972-1996, Wijster

| Gewasgroep<br>Advies | Beproefde gewassen | Fosfaatbemesting<br>(kg P <sub>2</sub> O <sub>5</sub> /ha/jaar) |      |      |      |      |
|----------------------|--------------------|-----------------------------------------------------------------|------|------|------|------|
|                      |                    | 0                                                               | 45   | 90   | 180  | 240  |
|                      |                    |                                                                 |      |      |      |      |
| Alle gewassen        |                    | 0.96                                                            | 1.00 | 1.06 | 1.10 | 1.10 |
|                      |                    |                                                                 |      |      |      |      |
| GG 1                 | Aardappel (13)     | 0.96                                                            | 1.00 | 1.05 | 1.10 | 1.11 |
| GG 2                 | Suikerbiet (5)     | 0.98                                                            | 1.00 | 1.11 | 1.14 | 1.13 |
| GG 3                 | Zomergerst (5)     | 0.95                                                            | 1.00 | 1.04 | 1.05 | 1.10 |
| GG 4                 | Zomertarwe (1)     | 1.01                                                            | 1.00 | 1.00 | 1.06 | 1.08 |

# Wijster, snijmaïs (rel)



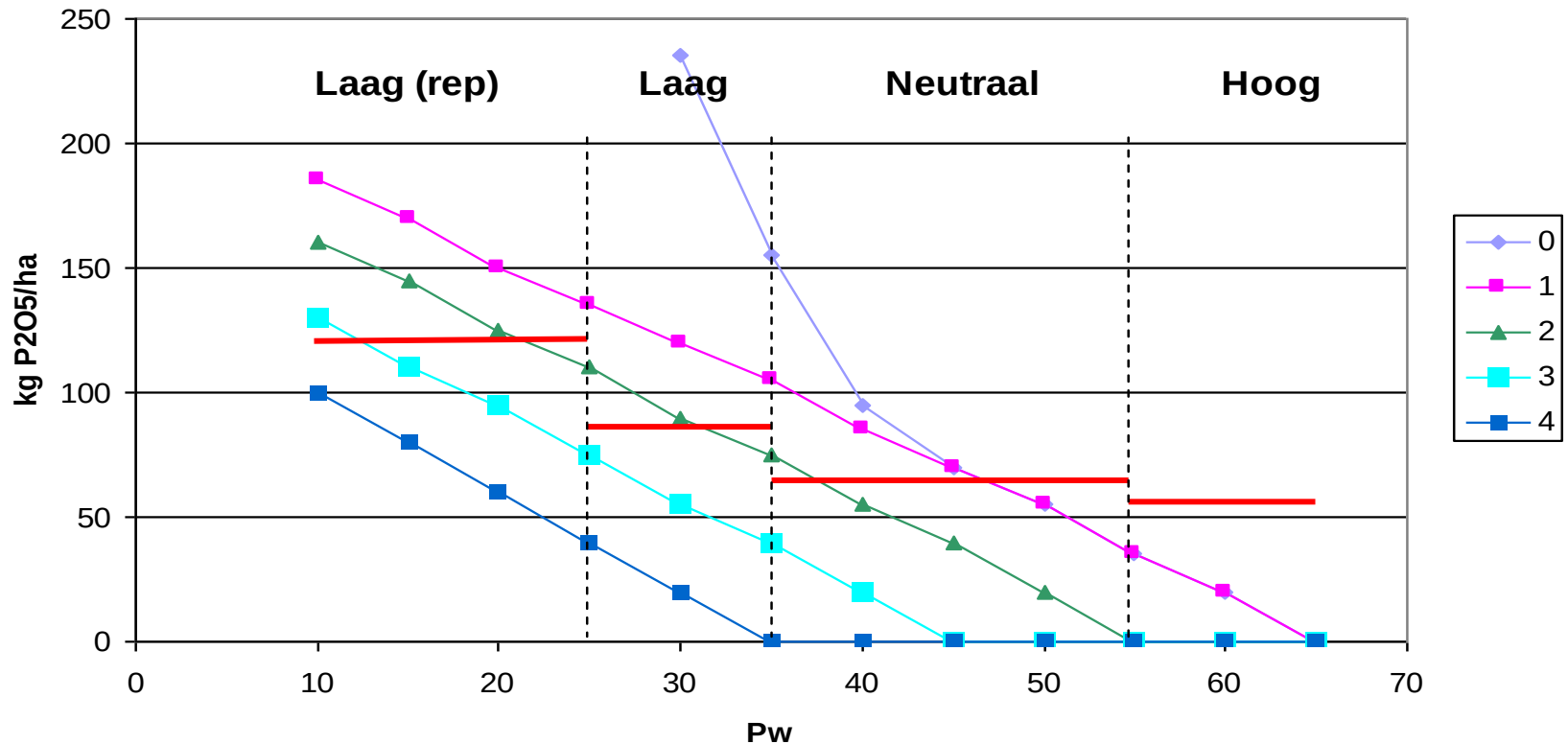


# Opbrengstderving bij GN 2013

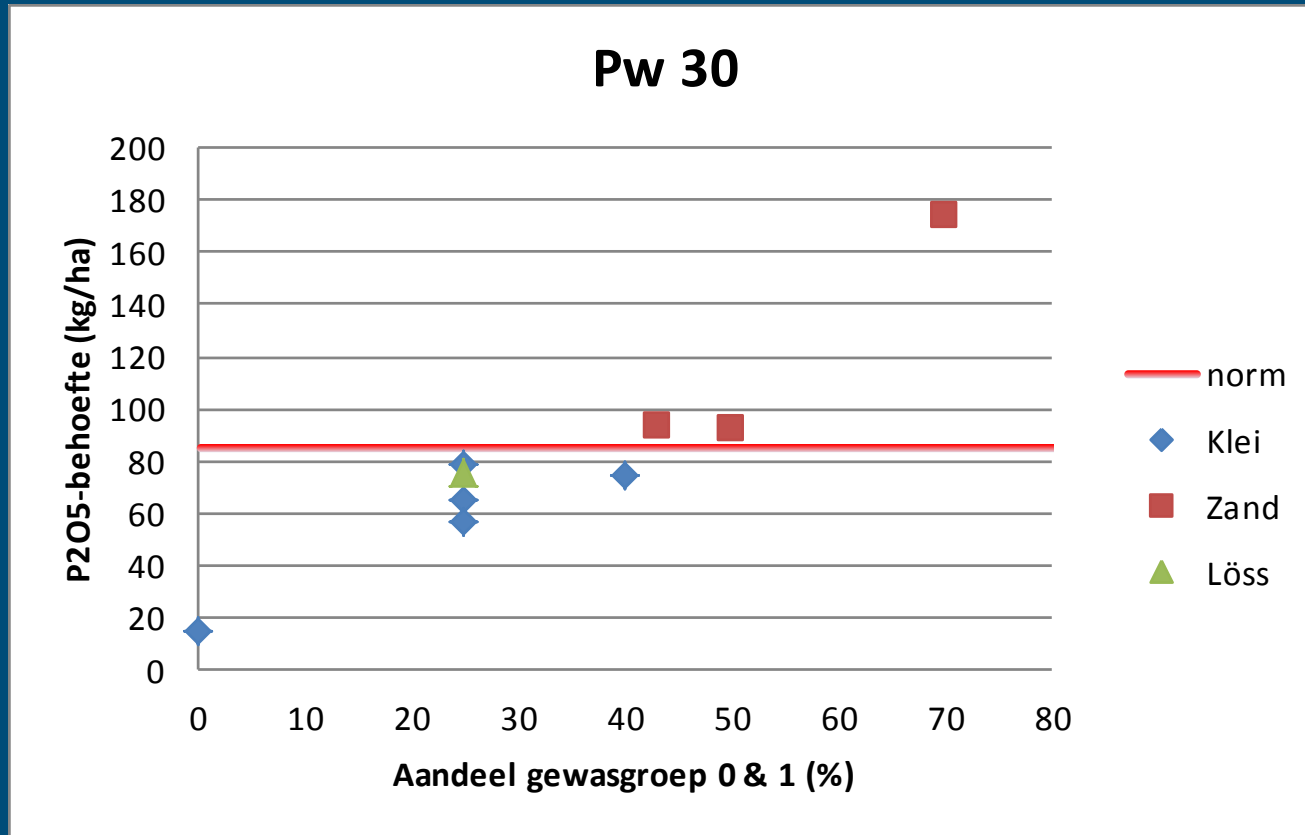
| Pw-getal | Gebruiksnorm<br>2013<br>(kg P <sub>205</sub> /ha) | Derving (%) t.o.v. <u>adviesgift</u> bij gewasgroep: |     |     |
|----------|---------------------------------------------------|------------------------------------------------------|-----|-----|
|          |                                                   | 0                                                    | 1   | 2   |
| 20       | 120                                               | -                                                    | 3.6 | 1.7 |
| 25       | 85                                                | -                                                    | 2.2 | 1.1 |
| 30       | 85                                                | 4.3                                                  | 0.8 | 0.8 |
| 35       | 85                                                | 2.1                                                  | 0.4 | 0.4 |
| 40       | 65                                                | 0.9                                                  | 0.4 | 0.4 |

# Behoefte **gewas**

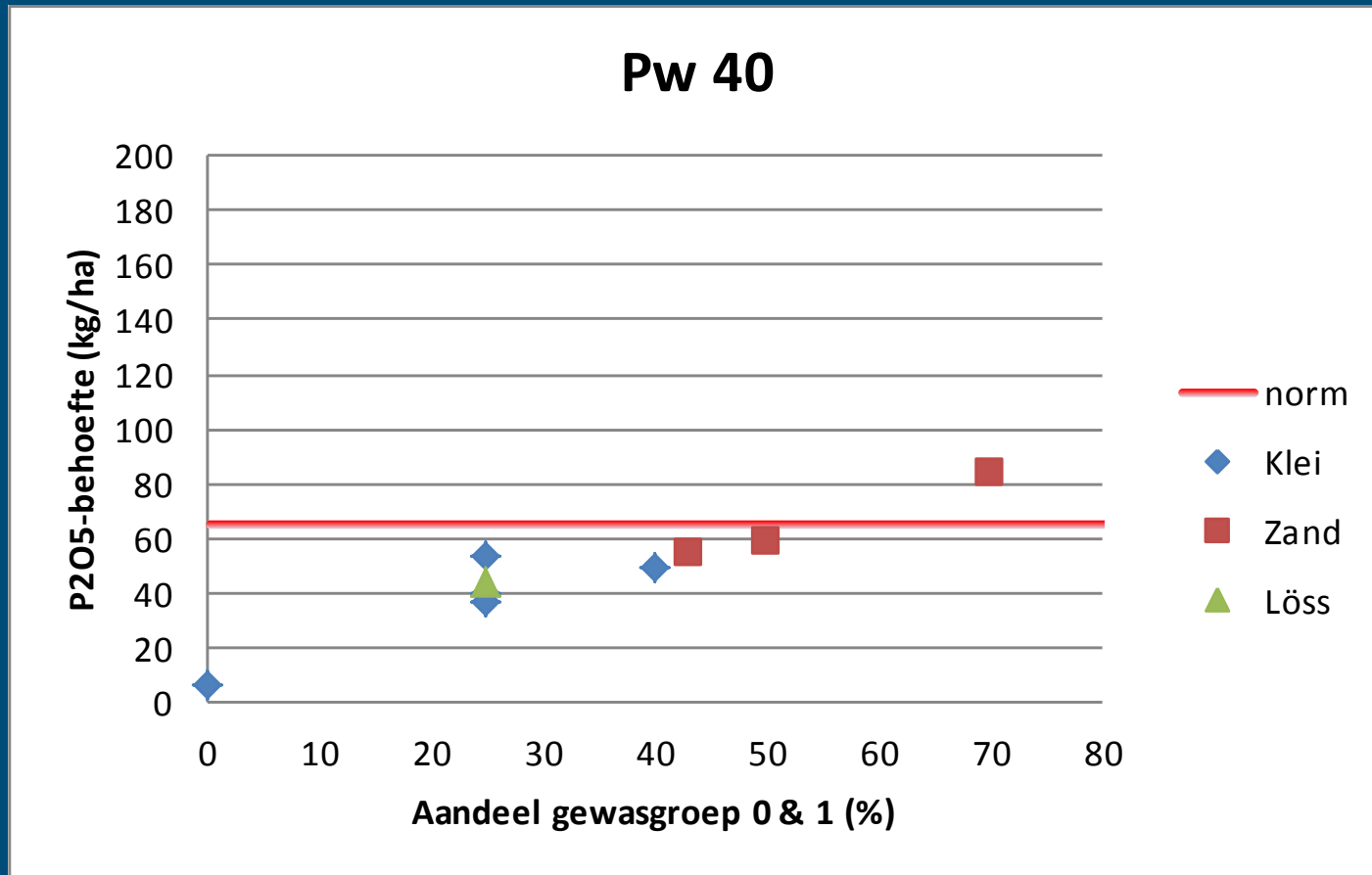
Dekzand, dalgrond, rivierklei, loss



# Fosfaatbehoefte bouwplan Pw 30



# Fosfaatbehoefte bouwplan Pw 40



# Conclusies

- Respons opbrengst op fosfaatbemesting/toestand relatief zwak
- Achterblijvende opbrengsten treden vooral op bij een lage fosfaattoestand ( $<$  streefwaarde)
- Risico's het grootst op bedrijven met hoog aandeel fosfaatbehoefte gewassen

# Einde!

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