MINAS
– the Dutch MINeral Accounting System

For the California Department of Food and Agriculture

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Content of the presentation

- A short introduction to Dutch agriculture
- MINAS: a profit and loss account on nutrients
  - That is auditable
- The rise and fall of MINAS as a Dutch policy instrument
- Concluding remarks
Location of the dairy farms and industry
Location of intensive livestock complex
Agricultural land use, 1.9 mln. ha.

- 53% grassland
- 42% arable land
- 5% vegetables & fruit
- 2% flowers, ornamentals and seeds

Overproduction of manure in pigs & poultry (+ some dairy)
Due to excessive imports of feed from overseas
MINAS: P & L in minerals (nutrients)

- Nitrogen, Phosphate and Potassium can enter a farm in different forms e.g.:
  - Feed
  - Fertilizer
  - Young animals reared elsewhere
- And leave the farm in different forms, e.g.
  - Milk
  - Live or dead animals
  - Manure etc.
- A flow statement (a profit and loss account) gives the full information ("a mineral balance").
Example: 55 ha farm (20 ha grass, 50 cows)

<table>
<thead>
<tr>
<th>USE of Nutrients (kg/year)</th>
<th>N</th>
<th>P</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young animals</td>
<td>2281</td>
<td>448</td>
<td>207</td>
</tr>
<tr>
<td>Seeds and plants</td>
<td>50</td>
<td>8</td>
<td>62</td>
</tr>
<tr>
<td>Compound feed</td>
<td>60545</td>
<td>11350</td>
<td>19369</td>
</tr>
<tr>
<td>Roughage</td>
<td>432</td>
<td>75</td>
<td>450</td>
</tr>
<tr>
<td>Fertilizer and manure</td>
<td>11810</td>
<td>954</td>
<td>3166</td>
</tr>
<tr>
<td>Environmental supply (peat, rain)</td>
<td>2695</td>
<td>50</td>
<td>226</td>
</tr>
<tr>
<td>Others (a.o. straw)</td>
<td>98</td>
<td>14</td>
<td>112</td>
</tr>
<tr>
<td><strong>TOTAL INPUT</strong></td>
<td>77911</td>
<td>12899</td>
<td>23592</td>
</tr>
</tbody>
</table>
### Example: output and surplus

#### Output of Nutrients (kg/year)

<table>
<thead>
<tr>
<th>Source</th>
<th>N</th>
<th>P</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animals</td>
<td>24370</td>
<td>4557</td>
<td>1647</td>
</tr>
<tr>
<td>Milk</td>
<td>1909</td>
<td>315</td>
<td>525</td>
</tr>
<tr>
<td>Plant products</td>
<td>3600</td>
<td>630</td>
<td>5420</td>
</tr>
<tr>
<td>Manure</td>
<td>28150</td>
<td>5911</td>
<td>14666</td>
</tr>
<tr>
<td>Others (e.g. garbage)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Total Output

- **N**: 58029
- **P**: 11413
- **K**: 20258

#### Total Input

- **N**: 77911
- **P**: 12899
- **K**: 23592

#### Surplus of Nutrients

- **N**: 19882
- **P**: 1486
- **K**: 3334

Per HA

- **N**: 361
- **P**: 27
- **K**: 61
Calculation methods

- Like profit and loss account: based on the physical units (kg milk etc.) on invoices (or delivery reports)
- With norms for all types of inputs and outputs
  - set rather high / low to promote use of real laboratory results on N / P content of products
- Feed companies started to provide invoices and yearly delivery reports with the N / P content of the feed for each farm
- Manure often tested (laboratory) on request buyer (arable farms)
- Separate software (excel), or integrated in management information system or (fiscal) accounting system.
In MINAS the data are auditable

- Due to integration with the fiscal profit and loss account (that is for tax reasons obliged on every farm)

- An input you want to cheat with and not declare in your Mineral Account (e.g. fertilizer), you would like to include in your P&L as a deductible cost.

- This principle does not work if manure prices are very negative (extreme surplus in the region)
  - And you have to make sure the manure is really transported (e.g. by obligation to register / announce manure transport)

- Therefor the agricultural accounting offices integrated the calculation in their work and signed the accounts off.
The rise and fall of MINAS

- 1984: Interim law that made new (extra) buildings illegal: stop the growth
- 1987: Mandate on maximum application rates of manure in kg Phosphate ($P_{2}O_{5}$) per ha
  - “Manure bookkeeping”
  - Decreasing from 350 to 90 (silage maize) between 1997 and 1996
- MINAS developed as a management tool around 1990 by an agri-environmental consultancy of farmers (CLM)
  - Big advantage: full substitution between different inputs (or outputs) gives insight in management options and farm comparison (benchmarking) supported
The rise and fall of MINAS

- 1993: consensus between government and farmers to base the environmental policy on an economic instrument in stead of physical mandates: MINAS as a policy instrument

- Large project on introduction:
  - Map data flows, add new ones for audit reasons or to make accounting easier
  - Develop and test audit-procedures
  - Adapt software
  - Extension: introduction with farmers, farm study groups
The rise and fall of MINAS

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- 1998: full scale introduction (after 2 years political delay)
The rise and fall (and re-rise) of MINAS

- 1998 introduced for farms with more than 2.5 animals per ha, later for all farms (including arable)
  - Surplus per ha is indicator for efficiency
  - Certain level is unavoidable (e.g. a loss rate of 5 kg)
  - The remaining surplus was taxed (prohibitively)
- 2003: EU Court of Justice (*NL vs. Eur. Commission*) ruled out MINAS as being incompatible with N-directive:
  - Loss rates / ha incompatible with use-rates of manure
  - Too high loss rates were “only” taxed, not forbidden
- 2006: Back to manure application and max. livestock / ha
- 2015: end of quota. Introduction “P-Cycle Manager”
Nitrogen reduction in %/year (per ha)

Decrease in use of N and P

Clear substitution in arable farming and dairy farming: more use of manure, replacing fertilizers

Source: OECD
Concluding remarks

- Great management tool
- Economic instrument (improves manure market) that gives farmers insight and more options for farm specific measures (like substitution fertilizer/manure) than a mandate/maximum animals per ha.
- But administrative burden for everybody in the chain
- And enforcement can be complex
- It does not punish high efficient farms, and forces inefficient ones to change
- It works if the manure market between livestock farms and arable land is in balance. Not if production has to be cut back considerably (too high negative manure price)
- Within farm (feedlot) problems not solved.