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# Good Agricultural Practice (GAP) of glasshouse lettuce and spinach

Registration during 2001-2002

C. de Kreij and L. van Aanholt

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**Praktijkonderzoek Plant & Omgeving**

Sector Glastuinbouw

Adres : P. O. Box 8  
: 2670 AA Naaldwijk, The Netherlands

Tel. : 0174 - 636700

Fax : 0174 - 636835

E-mail : [info@ppo.dlo.nl](mailto:info@ppo.dlo.nl)

Internet : [www.ppo.dlo.nl](http://www.ppo.dlo.nl)

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# 1 Introduction

This report deals with registration of Good Agricultural Practice for glasshouse lettuce and spinach. It covers the period September 2001 – June 2002. It has been calculated from earlier registrations that it was possible to get a reliable result with a selective sampling. The auctions *the Greenery* and *ZON* selected growers based on earlier experience that these growers supplied regularly lettuce or spinach to the auction and these growers were willing to register accurately. These growers had to report a planned harvest about 10 days before harvest date. The auctions asked the Environment-Conscious-Cultivation (Certa) to sample the heads at the nurseries. Samples were analysed at the TNO Nutrition and Food Research Institute. Nitrate contents were reported to the auctions. These data together with the registration of the growers were processed by the Applied Plant Research – Division Glasshouse Horticulture on request of the Productboard of Horticulture (Productschap Tuinbouw).

## 2 Spread of the registration

Total number of registration for lettuce was 65 from 44 growers. This is an area of 14.6 ha of in total about 300 ha (Van den Berg en Cadet, 2000). This is all under glass. The number of registration for spinach is 38 from 18 growers. This is 11 registration under glass and 27 registrations outdoor spinach. The spinach registration covers 30 ha of a total of 1862 ha in 2001 (Van den Berg, personal communication).

## 3 Soil analysis and nitrogen recommendation in lettuce

Soil samples were taken before fertilisation and planting. Samples were analysed according the 1:2 volume water extract (Sonneveld and van den Ende, 1971). The reported EC, nitrate and chloride concentrations in the extract are reported in Figure 1, 2 and 3, respectively. The target EC is 1.2 – 1.5 mS/cm depending on the soil type and time of the year (Van den Bos *et al.*, 1999). Most growers had optimum values. However, some growers had too high EC in the soil. Nitrate optimal values range from 3.5 – 6.0 mmol/l. Most growers had lower values than optimal, which is understandable, since the sampling was before the fertilisation. After fertilisation the optimal values have to be reached. The chloride values were often below the optimal for winter production, which is at least 2.0 mmol/l.

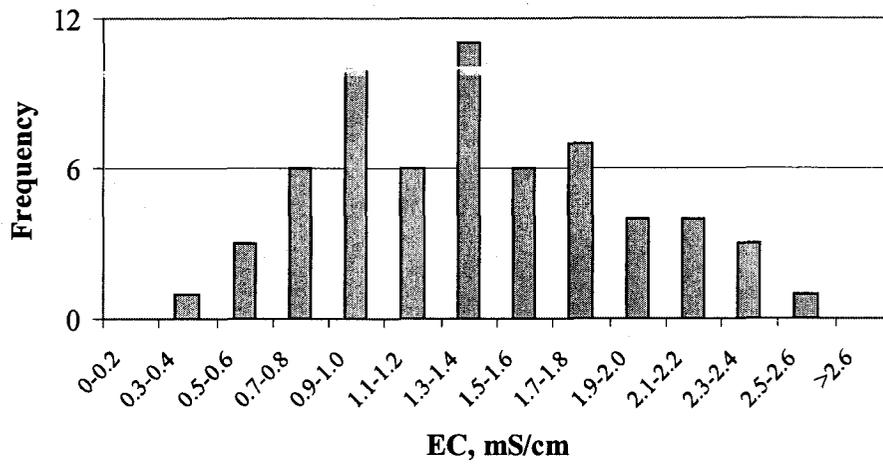


Figure 1. EC in the 1:2 volume water extract of soil samples.

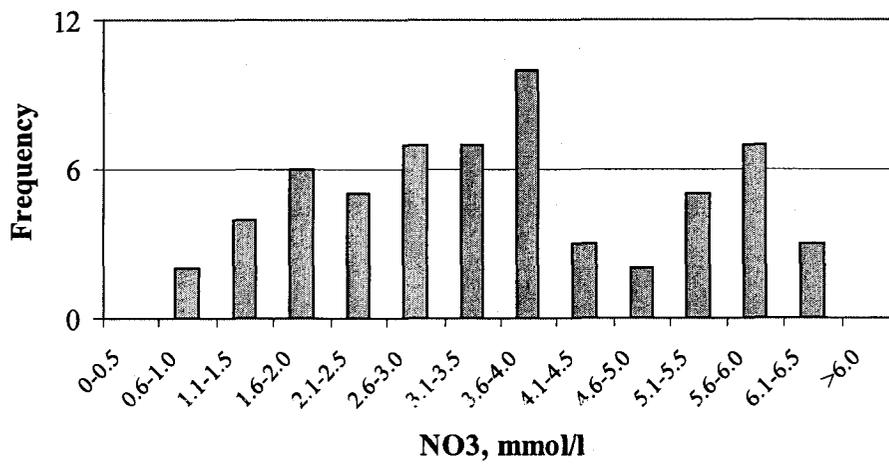


Figure 2. Nitrate content in the 1:2 volume water extract.

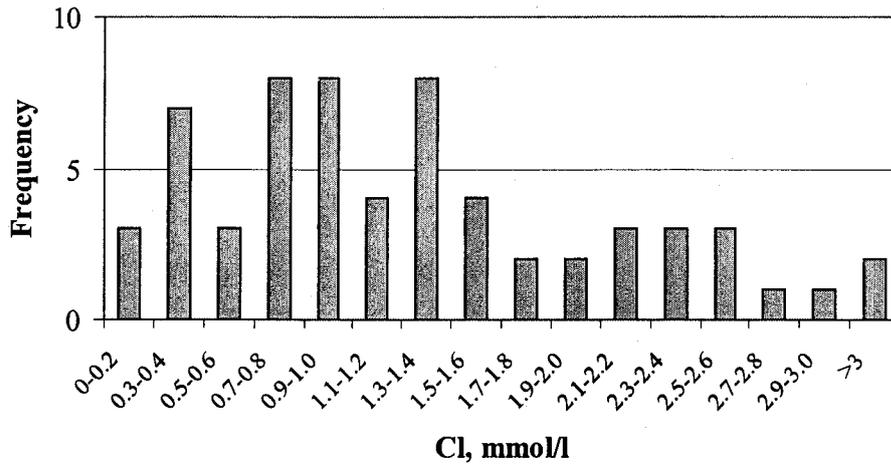


Figure 3. Chloride content in the 1:2 volume water extract.

From the nitrate levels in the 1:2 volume water extract the N-recommendation can be calculated. To be practical for all data the target has been taken at 5.0 mmol/l (Van den Bos et al, 1999). The N-recommendation in kg/ha is then:  $5 - (\text{nitrate in soil analysis}) * 56$ . The N-recommendations are given in Figure 4.

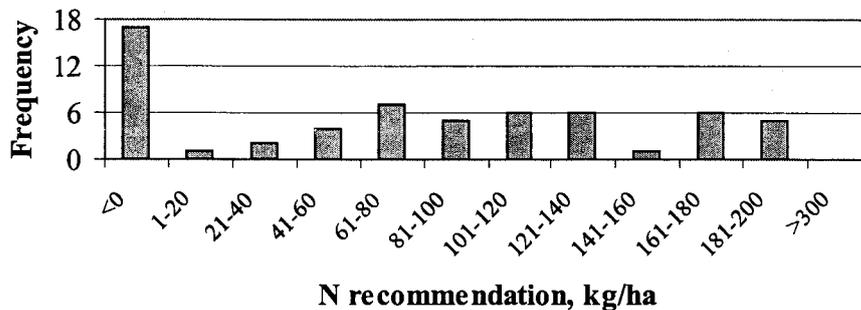


Figure 4. The N-recommendation calculated from the nitrogen content in the 1:2 volume extracts.

The recommendation is a number of samples 0. However, it varies a lot. From the sheets of the growers the actual N-fertilisation has been calculated. The data are given in Figure 5. Also several growers did not supply any N-fertilisation before planting. There is also a large variation in the N-supply before planting.

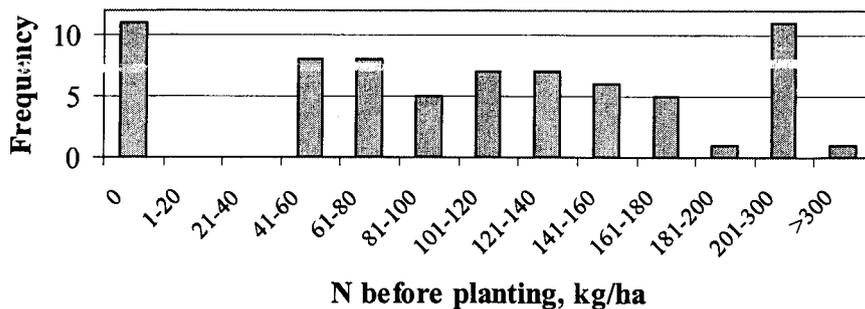


Figure 5. Nitrogen fertilisation before planting.

The amount of N supplied during the growing period is given in Figure 6. A number of growers did not supply any N during the growing period.

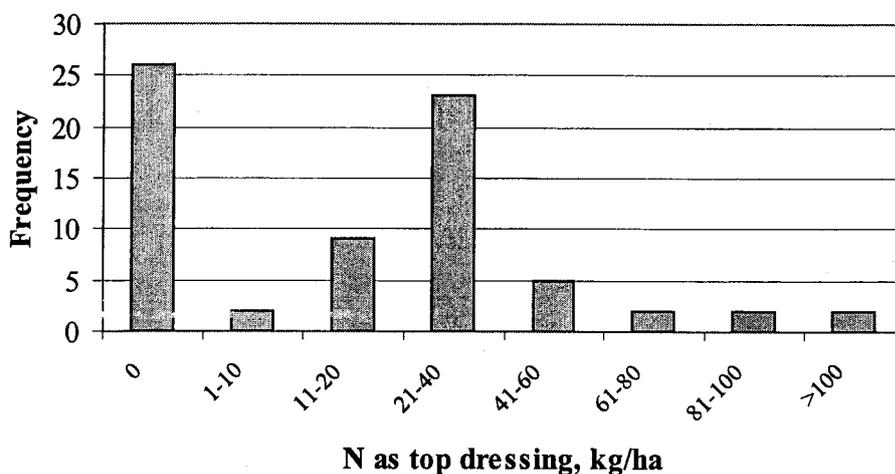
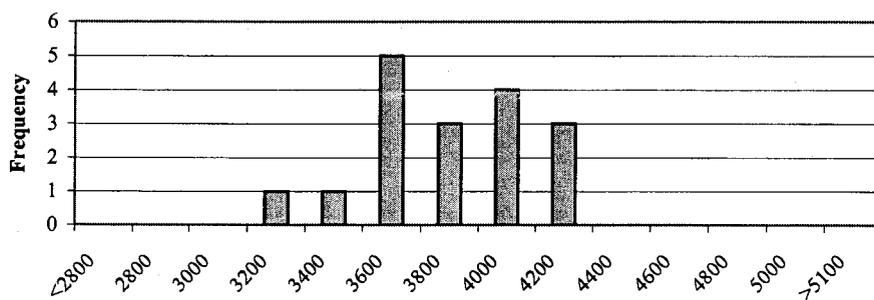


Figure 6. Nitrogen supply during the growing period.

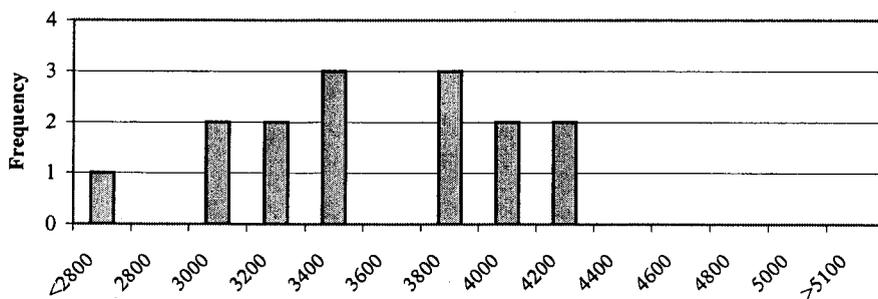
## 4 Nitrate in lettuce

Nitrate in lettuce is given in Figure 7. Nitrate levels in lettuce never exceeded the EU limit of 4500 mg/kg during winter (October – 31 March) or the target during summer of 3500 mg/kg fresh material (EU directive 563/2002 of 2 April 2002).

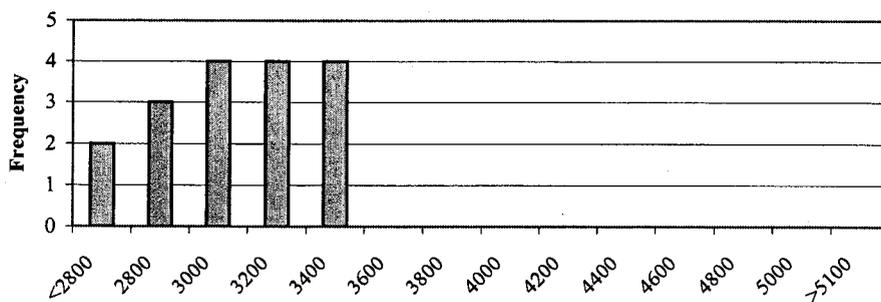
Oct.-Nov.-Dec 2001



Jan-feb 2002



March. 2002



Apr. 2002

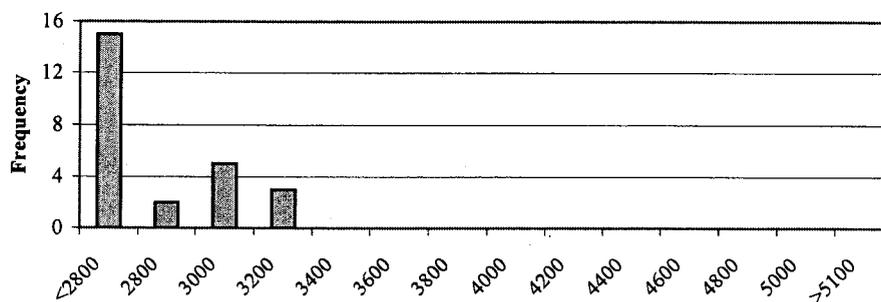


Figure 7. Nitrate in lettuce related to the time of sampling

## 5 Nitrate in spinach

Nitrate levels in spinach are given in Figure 8. In September 2001 the EU (summer)-limit of 2500 mg/kg (EU directive 563/2002 of 2 April 2002) has not been exceeded. In October 2001 – March 2002 the EU (winter) limit of 3000 mg/kg has been exceeded in 10 of the 17 samples (being 59 %). In April - June 2002 the EU (summer) limit of 2500 mg/kg has been exceeded in 1 of the 15 samples.

The NL-(winter)-limit of 4500 mg/kg has been exceeded in 1 sample only in January – March 2002. The NL-(summer)-limit of 3500 mg/kg has never been exceeded.

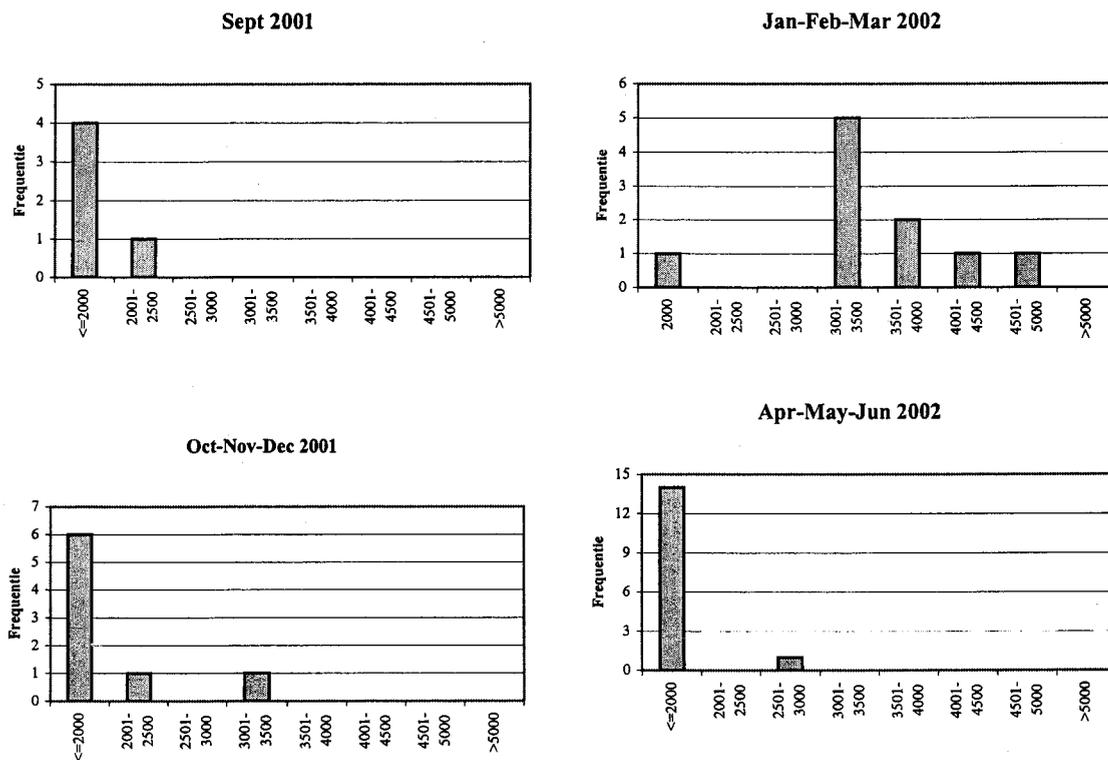


Figure 8. Nitrate content of spinach in relation to the time of sampling.

## 6 Conclusion and summary

A sample survey has been executed during September 2001 – June 2002 from 44 lettuce and 18 spinach growers. These growers registered 65 and 38 crops for lettuce and spinach respectively. This has been estimated to give a representative and reliable view of the lettuce and spinach growing. The nitrogen levels in the soil correspond to the target values. The chloride levels in the soil were too low. Growers have to use more chloride containing fertiliser in winter grown lettuce. Nitrate contents in lettuce never exceeded the EU levels.

The spinach nitrate levels were in the winter period (October – 31 March) in 59 % of the samples higher than the EU limit of 3000 mg/kg. In the summer period the values exceeded in 1 of the 15 samples the EU limit of 2500 mg/kg. The NL-limit in the winter of 4500 mg/kg was exceeded in 1 of the 17 samples. The NL-(summer)-limit of 3500 mg/kg has never been exceeded.

### Literature

- Sonneveld, C. and J. van den Ende, 1971. Soil analysis by means of a 1:2 volume water extract. *Plant and Soil* 35:505-516
- Van den Berg, W. and W.Cadel, 2000. Cijfermatig overzicht krop- en ijsbergsla (Data overview of butterhead lettuce and iceberg lettuce). Pt-rapport 2000-37
- Van den Bos, A. C. de Kreij, and W. Voogt, 1999. Bemestingsadviesbasis Grond.