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Project: 1333 **Research on the usage of FYTOCELL as a soil improving material.**

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Research on the usage of Fytocell as a soil improving material

Summary

In 1999 Fytogreen commissioned several researches to commence with the product Fytocell. The requirements of products such as peat soil matter and other organic products are formulated by the 'Soil Supplement Regulations' (RAG) and by the 'Potting Soil Trade Regulation' (RHP). New products for which there are no product requirements available, must be investigated. Depending on the area of application, extra requirements maybe necessary. Positive effects are expected with the application of Fytocell as a soil improver in mineral soil or in potting soil.
The Research Station for the Nursery Stock has carried out the following research:

A. The mineral soil: plant hole treatment at the Research Station, Zundert for Nursery Stock and as soil improver in full soil at Boot & Co., Zundert.
B. As an additional mix with peat to improve the physical quality of the potting soil.

Plant hole, Research Station, Zundert

An increase in available nutrient elements, especially nitrogen and potassium is recorded due to the addition of Fytocell. The pH in the lime free sandy soil reduced by 0.5 units. It may be necessary to compensate this by adding lime. The % of fine particles < 50 mu increased with 2-weight % per 10-volume % Fytocell. With Fytocell in the plant hole the amount of moisture increases by 5 to 6 volume % per 10-volume % Fytocell in the mixture. The bulk moist and dry weight reduces by mixing with Fytocell. For moist weight, this is approximately 1.6 weight % per 10-volume % Fytocell. For dry weight this is approximately 3-weight %.
With the addition of Fytocell the resistance or strength is reduced. In week 44 the soil shows more resistance than in week 20.

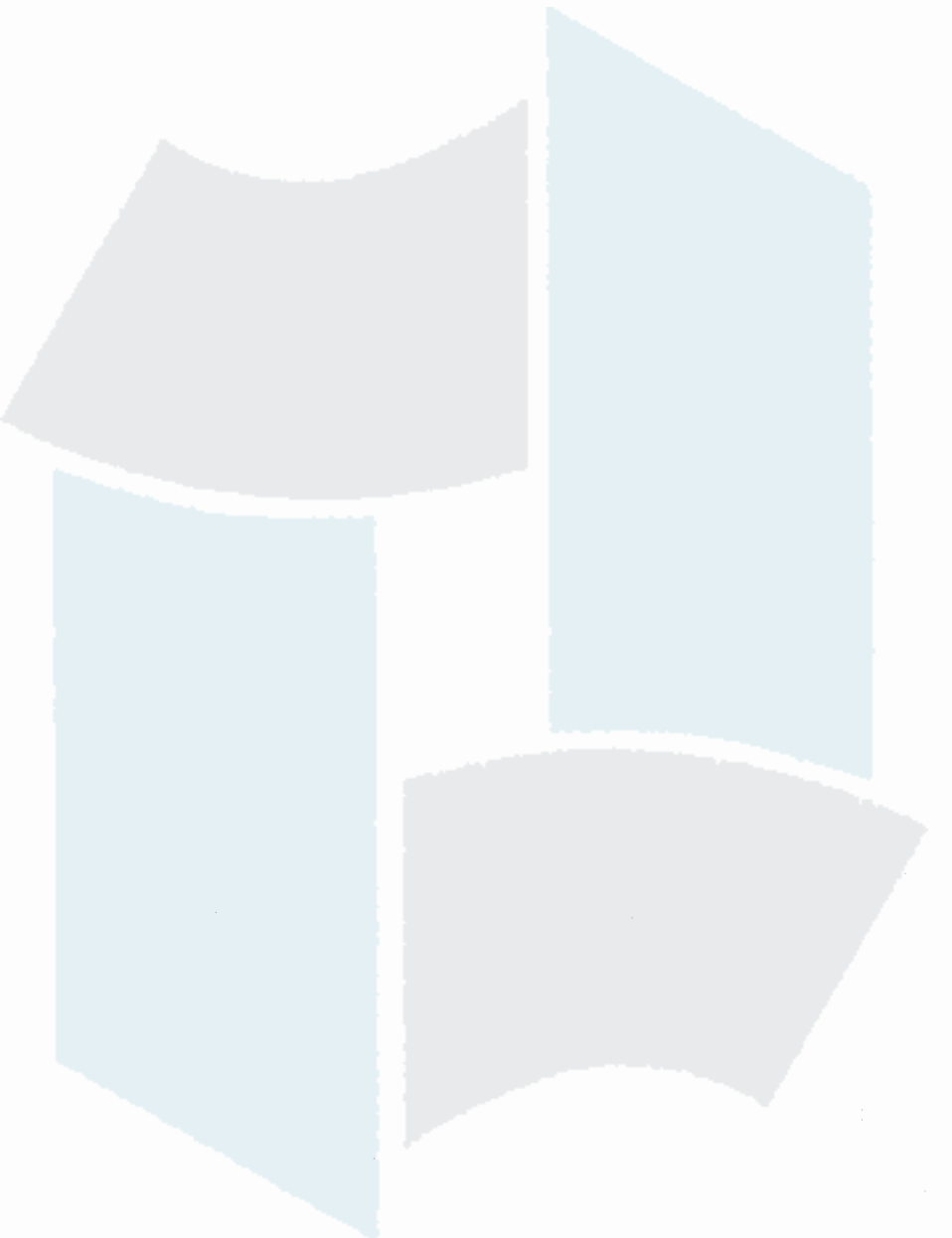
Cultivated Soil, Boot, Zundert

An increase was recorded in moisture volume % of approximately 8% per 10-volume % Fytocell. The moist and dry bulk weight reduced with respectively 4 and 6-weight % per 10-volume % Fytocell.
The strength or resistance of the soil decreases by using Fytocell. The plants were longer and the fresh and dry weight higher. The root quality received a higher rating by using Fytocell.

In the potting soil, Research Station, Boskoop

By mixing Fytocell with peat the air rating in the soil increased. The moisture availability was only slightly reduced. The root quality was improved by using Fytocell.

Fytocell has a low pH and an addition of lime is required: 3 – 4 kg carbonic acid magnesia lime per m3 Fytocell. It is advised not to add Pg-mix for the volume part of the Fytocell in connection with the greater availability of nutrient elements by using Fytocell.
The Buddleja had more branches and a better root system by using Fytocell in the potting soil. Chamaecyparis nootkatensis had a better root rating by using Fytocell.



Research on the usage of Fytocell as a soil improving material

For mineral soils and as a partial replacement of peat in potting soil.

Introduction:

In 1999 Fytogreen commissioned several researches to commence with the product Fytocell. The aim of this research is to establish the usage or application possibilities of Fytocell in mineral soil and in potting soil.
The requirements of products such as peat soil matter and other organic products are formulated by the 'Soil Supplement Regulation' (RAG) and by the 'Potting Soil Trade Regulations'(RHP). Standardization in product requirements is adapted for the connected companies, which fall under the control of this regulation.
New products for which there are no product requirements available, must be investigated. Depending on the area of application, extra requirements maybe necessary which have not yet been carried out in this standardized control system.
For the application of Fytocell as a soil improver in mineral soil or in potting soil (positive effects are expected).
Here are a few qualities for which the material can be used:

- Increase in soil pore volume
- Increase/Decrease of soils moisture capacity
- Increase in buffer capacity and mineral capacity/ability of the soil
- Increase in soil aeration

For crops grown outside and in the green zones products such as Fytocell have rarely been used. Therefore, it is necessary to carry out basic research.

Research

The research carried out can be split into:

A. With mineral soil, sandy soil as plant hole treatment as well as a full-field treatment as a soil improver. Fytocell is mixed with the soil in both situations.
B. As an additional mix with peat to improve the physical quality of the potting soil.

Aim:

A. Research on the usage of FYTOCELL flakes in mineral soil:
Establish the differences in physical properties of tree sand in the plant hole and soil improvement of the covering sand as a result of applying Fytocell. Which soil parameters are interesting and what are the achieved effects?

A.1 <u>**Plant hole treatment for 'street trees'**</u> at unsuitable growing locations. Properties such as strength, setting/shrinkage and moisture retention capacity are of importance. Improvement of the soil cultivation or rootable layer for the crops.

A.2 <u>**Soil improvement for cultivation of plants delivered with root.**</u> The improvement of the cultivated soil or rootable layer for the crops. Growth of the crops, root ability, root form and moisture retention capacity of the soil are of importance here.

B. Establish the usage of Fytocell as a soil improving material in potting soil. The influence of Fytocell on the quality of the plant and the relationship to physical and chemical aspects of the substrate.

B.1 Trial with 4 mixtures to establish the physical and chemical properties by adding Fytocell to peat.
B.2 Trial as demonstration for the automatic water supply where 2 mixtures of potting soil are placed on lava and concrete bedding ground.
The **potting soil mixture was without and with 20% volume % Fytocell flakes.**

Research Carried Out:

A.1 Sand soil mixtures in plant holes
A plant hole treatment where Fytocell is mixed.
Fytocell fraction 2-15 mm is mixed with sand from the plant hole and as a mixture brought into the plant hole.
The research was carried out at the Research Station, Zundert.
Set up Samples:
A.1 On sandy soil plant holes with 3 mixtures of sand soil – Research Station, Zundert
Plant hole A. control untreated
Plant hole B. 15 volume% FYTOCELL flakes
Plant hole C. 30 volume% FYTOCELL flakes
Quantity:
Plant hole B. 52,5 litre FYTOCELL
Plant hole C. 105 litre FYTOCELL
Plant holes measuring 70x70x70 cm were dug. Fytocell was mixed with the soil from the plant holes. The thickness of the humus-cultivated layer was approximately 38cm. A mould was placed on the edge of the plant hole, increasing the size of the hole with a height of 10 cm (capacity). Volume solid soil 350 litres and loose soil 400 litres.
The amount of soil, which did not fit into the plant hole after mixing, was measured.
The soil in the plant hole is not extra condensed. This means that a maximum sagging can be achieved. Normally the soil would be pressed down by 10 N / cm2.

A. **2 Improving the soil cultivation as full-field treatment**
Fytocell with a sift reaction 2-15 mm was used. In three mixtures Fytocell was mixed with sandy soil as soil culture to a depth of 30 cm. The research location was Boot & Co. Nursery, Zundert.
Treatment area 250 m2.
Boot 1. control untreated 250 m2.
Boot 2. 12,5 volume% Fytocell flakes; 250 m2; 3,75 cm thick layer.
Boot 3. 25 volume% Fytocell flakes; 250 m2; 7 cm thick layer.
Method:
2x bored through to a thickness of 30 cm in order to achieve a good mixture.
Crop: Amelanchier lamarckii and Pinus nigra nigra. These plants are delivered with root after 2 or more growing seasons. Plant Distance: 70 x 70 cm. The application of Proof A.2 "Improving the soil cultivation", was carried out by Boot & Co. Nursery on a dry sensitive ground. The plant date was the end of April 1999 and the plants will remain on this plot until at least the end of October 2000. The physical properties of the soil were established. The Research Station at the Nursery carried out the expert soil measurements and the crop observation.

B.1 Fytocell as improver of the potting soil quality.
Carried out: Location: Research Station, Nursery Stock, Boskoop
Treatments:
1. control untreated – standard potting soil;
2. 10 volume% Fytocell flakes added;
3. 20 volume% Fytocell flakes added;
4. 30 volume% Fytocell flakes added

The potting soil is fertilized with 1 kg PG-mix per m3 and 3 kg carbonic acid magnesia lime with 10% MgO per m3 used.
Container size: 3 litre (wide container), 16 containers per m2, and with ground coverage of 44%.
Crop: Buddleja davidii 'Pink Delight' (Rooted plug). The begin date for planting was week 28 and the end of the review was week 45 in 1999.
Fertilization: via drip and overhead. Composition of the feeding solution per litre: 6,5 mmol NO3; 0,75 mmol NH4; 0,75 mmol P; 2 mmol K; 2 mmol K; 0,75 mmol Mg; 0,75 mmol S; EC-values 0,8 mS

B.2 Establish the usage of FYTOCELL in potting soil
Carried out by: Location Research Station for Nursery Stock, Boskoop.
Treatments:
1 lava floor or subsoil, potting soil without Fytocell;
2-lava floor or subsoil, potting soil with 20-volume % Fytocell;
3 concrete floor of subsoil, potting soil without Fytocell;
4 concrete floor or subsoil, potting soil with 20-volume % Fytocell.

Potting soil basis contains: seaweed peat limed with 3 kg carbonic acid magnesia lime with 10% MgO, 0,5 kg Pg-mix and 3 kg Osmocote 8/9 months working per m3. The container size was 3 litres. And there were 14 containers per m2. The begin date for planting was in week 16, 1999 and the end of the review was in week 45 in 1999.
Crop: Chamaecyparis nootkatensis 'Glauca' and Chamaecyparis nootkatensis 'Aurea'

Measurements:

A.1 Plant holes, Research Station, Zundert
1. Granular and chemical composition of the soil;
2. Height of the ground in plant holes determined by using a fixed pole height and calculating the sagging;
3. 'Ring' samples taken in week 20, 32 and 44 and calculation of physical values;
4. Strength measured with the 'penetrograaf' in week 20 and 44.

A.2 Soil improvement of the cultivated soil at Boot & Co.
1. Analyse granular and chemical composition of the soil;
2. 'Ring' samples taken in week 20, 34 and 44 for physical research;
3. Strength measured with the 'penetrograat' in week 20 and 44;
4. Crop observation at start of week 34 and week 44.

B1 and B2 Usage of FYTOCELL in potting soil, Research Station, Boskoop

1. Physical potting soil research at the start of week 17 or week 28 in 1999;
2. Chemical analysis of the potting soil mixtures at the start and the additional fertilization research during the cultivation;
3. Crop observation at the start and in week 45

Results

A.1 From Plant holes at Research Station, Zundert

In appendix 1 the results of the N-mineral, granular and fertilization research are registered. Due to the addition of Fytocell there is a large increase of nitrogen and potassium available. The pH reduces by 0.5 units by adding Fytocell. The percentage of fine particles < 50 mu increases with 3 weight % per 15 volume % with the addition of Fytocell.
In the fertilization research it is determined that the availability of nutrient elements increased by using Fytocell.

Loosening the soil and adding Fytocell recorded a volume increase.
For **Treatment A**. control this was 90 litres or **25,7 %.**
For **Treatment B**. 15 volume % Fytocell this was 130 litres - 52,5 litres Fytocell is 77,5 litres or **22,1%.**
For **Treatment C.** 30 volume% Fytocell this was 186 litres - 105 litres Fytocell is 81 litres or **23,1 %.**
Fytocell is hardly compressible in the soil mixture.

The sagging observation of the surface is shown in appendix 2.
The average calculated figures of sagging are shown in Table 1.

Table 1 A.1 Sagging in mm in 1999 of the plant hole, Research Station, Zundert

Treatment	Week 20	Week 34	Week 44	Week 44 in %
Plant hole A	6,8	25,1	29,6	3,7%
Plant hole B	9,6	29,8	29,4	3,7%
Plant hole C	9,7	37,6	44,3	5,5%

The sagging increases during the period and mainly occurs with the highest dosage.

The observation and calculation of the moisture volume %, the moist and dry bulk weight are illustrated in appendix 3, 4 and 5.
The summary of results is illustrated respectively in Tables 2, 3 and 4.

Table 2 A.1 Moist Volume % in the plant holes, Research Station, Zundert

Treatment	Week 20	Week 34	Week 44	Week 44 in %
Plant hole A	22	15,3	17,3	100%
Plant hole B	20,3	17,7	18,9	109,2%
Plant hole C	19,7	17,6	20,0	115,6%

In week 20 with the looser soil there is a slight decrease in available moisture and later an increase in moisture capacity. In week 44 there is a strong increase in the moisture buffer due to the addition of 30-volume % Fytocell.

Table 3 A.1 Moist bulk weight in g/cm3 in the plant holes, Research Station, Zundert

Treatment	Week 20	Week 34	Week 44	Week 44 in %
Plant hole A	1,73	1,61	1,67	100%
Plant hole B	1,63	1,60	1,63	97,6%
Plant hole C	1,57	1,55	1,56	93,4%

By applying Fytocell the moist bulk weight decreases.

Table 4 A.1 Dry bulk weight in g/cm3 in the plant holes, Research Station, Zundert

Treatment	Week 20	Week 34	Week 44	Week 44 in %
Plant hole A	1,51	1,46	1,50	100%
Plant hole B	1,43	1,42	1,44	96%
Plant hole C	1,37	1,36	1,37	91,3%

By applying Fytocell the dry bulk weight decreases.

The strength measurements of the plant holes at the Research Station, Zundert are shown in Appendix 6 and 7. The untreated soil has a high resistance and is condensed from a depth of 40 – 50 cm in order to enable rooting. The limit value for strength or resistance for woody crops is 300 N / cm2. This value maybe 200 – 250 N / cm2 for sensitive crops.
In week 20, 2 weeks after filling, the plant holes with Fytocell have a lower resistance than those without Fytocell. The greatest difference occurs with 30-volume % Fytocell. Depending on the depth of the soil profile to 15 N / cm 2, soil with Fytocell shows a lower resistance compared to soil without Fytocell.
There is room for sagging of the soil composition (setting).
All measured values in the plant holes are low when this is compared to the limit values for condensation and rooting of the Nursery Stock crops.

Results

A.2 Soil improvement of the cultivated soil at Boot & Co.

A.2.1
The results of the N-mineral, granular and fertilization research are shown in appendix 1. By adding Fytocell there is a slight increase in nitrogen and potassium available. The base control level was already very high. The pH in this strongly buffered soil is hardly changed by adding Fytocell. The percentage of fine particles , 50 mu remained the same whilst using Fytocell. It was established in the fertilization research that there is an increase in the availability of nutrient elements by using Fytocell. The percentage of organic matter increased by approximately 1 %.

A.2.2
The base information of the moist volume %, the moist bulk weight and the dry bulk weight at Boot & Co. are illustrated in appendix 9, 10 and 11. The averages are shown in Table 5, 6 and 7.

Table 5 A.2 Moist Volume % in the cultivated soil at Boot & Co.

Treatment	Week 20	Week 34	Week 44	Week 44
Boot 1	26,1	20,1	23,4	100%
Boot 2	31,2	22,7	27,1	116%
Boot 3	31,2	29,3	29,0	124%

By applying Fytocell there is an increased availability of moisture.

Table 5 A.2 Moist bulk weight in g/cm3 in the soil at Boot & Co.

Treatment	Week 20	Week 34	Week 44	Week 44
Boot 1	1,68	1,55	1,65	100%
Boot 2	1,54	1,49	1,49	90%
Boot 3	1,51	1,47	1,45	88%

By applying Fytocell the moist bulk weight decreases.

Table 6 A.2 Dry bulk weight in g/cm3 in the soil at Boot & Co.

Treatment	Week 20	Week 34	Week 44	Week 44
Boot 1	1,42	1,35	1,42	100%
Boot 2	1,22	1,24	1,22	86%
Boot 3	1,20	1,19	1,16	82%

By applying Fytocell the dry bulk weight decreases.

A.2.3

The strength or resistance of the crop Amelanchier at Boot & Co. are illustrated in appendix 8.

In week 20, three weeks after planting, there was a lowered resistance measured in the soil with Fytocell than without Fytocell. The greatest difference occurs with 25-volume % Fytocell. The soil has more resistance in week 44 than in week 20. With Fytocell Depending on the depth of the soil profile to 10 – 35 N/ cm 2, soil with Fytocell shows lower resistance than soil without Fytocell.

When a comparison is made with the limit values for the rooting of Nursery Stock crops in general, all of the measured resistances are sufficiently low in the profile to a depth of approximately 50 cm. The obvious lower resistance in the root zone by adding Fytocell can have a positive effect, because this limit value for sensitive crops for the condensation of the soil are roughly estimated.

A.2.4

The crop observation at Boot & Co. of the objects treated with Fytocell is recorded in appendix 12 – 16.

Table 7 A.2 The length of the Amelanchier in cm in the soil with Fytocell, Boot in1999

Treatment	Week 20	Week 34	Week 44	Week 44
Boot1-control	39,5	64,5	63,4	100%
Boot2 - 12,5%	50,1	114,2	113,4	179%
Boot3-25%	54,4	115,0	114,1	180%

By applying Fytocell the length of the plants increases.

Table 8 A.2 Fresh and dry weight - Amelanchier in the soil with Fytocell, Boot

Treatment	Week 44 Fresh in g	Week 44 Fresh in %	Week 44 Dry in g	Week 44 Dry in %
Boot1-control	54,3	100%	31,2	100%
Boot2 - 12,5%	126,9	184%	69,6	223%
Boot3-25%	183,5	338%	99,0	317%

By adding Fytocell the fresh and dry weight increases.

Table 9 A.2 Growth in length in cm – Pinus in soil with Fytocell at Boot.

Treatment	Week 44 Total Plant	Week 44 Total Plant	Week 44 Young Shoot	Week 44 Young Shoot
Boot1-control	*	*	*	*
Boot2 - 12,5%	82,1 cm	100%	15,6 cm	100%
Boot3-25%	82,2 cm	100,2%	17,05 cm	109%

*There was no control treatment present.
Due to the application of Fytocell the length of the plants were higher.

Results

B1 and B2 Usage of FYTOCELL in potting soil at the Research Station, Boskoop

B.1.1 and B.2.1
In two cultivated trials Fytocell has been used in potting soil for container cultivation. The physical analysis results are shown in appendix 17 – 22.

Table 10 B.1.1 The air and water ratings in the potting soil mixtures for Buddleja, in Boskoop during week 28 1999 at the beginning of the trial.

Treatment	air vol% - 10 cm	air vol% -50 cm	Water vol% -10 -50 cm	Water vol% -10 -100 cm
1. Control	7	40	33	40
2.10 % Fytocell	12	43	31	38
3.20 % Fytocell	13	44	31	38
4.30 % Fytocell	15	46	31	36

Air volume % increased with 5% when the first 10-volume % Fytocell was mixed through. When a larger volume % Fytocell was mixed through the potting soil the volume % increased only slightly. The amount of water absorbed only slightly decreases by adding Fytocell.

Table 11 B.2.1 The air and water ratings in the potting soil mixture for Chamaecyparis nootkatensis in Boskoop during week 17 1999; at the beginning of the trial.

Treatment	air vol% - 10 cm	Air vol% - 50 cm	Water vol% -10 - 50 cm	Water vol% -10 - 100 cm
Control	9	42	33	39
20 % Fytocell	14	45	31	37

The volume % air increased with 5% when the mixture contained 20 volume % Fytocell. The amount of water absorption decreased only slightly.

B.1.2 and B.2.2
The chemical analyses of both container trials are shown in appendix 23. It was established in the trial that with increased amounts of Fytocell in the potting soil mixture the availability of all nutrient elements in the potting soil increases. With the 30-volume % dosage of Fytocell the concentration of nutrients and EC-values recorded was too high. Later during the growing season no differences in nutrient elements of the potting soil were recorded. The pH values remained at an acceptable level at the beginning of the cultivation and later during the growing season. The water used was recycled water. This water had low nutrient ratings with the exception of quite high calcium and magnesium rates. The bicarbonate rate is normal and assisted in buffering and stabilizing the pH of the potting soil.

B.1.3 and B.2.3
The plants in the containers were judged on their growth and the results of this are illustrated in appendix 24 – 31.
The results of the crop observation on the Buddleja are summarized in Table 11 and from Chamaecyparis nootkatensis they are shown in Table 12 and 13.

Table 11 B 1.3 Results of the crop growth of Buddleja by adding Fytocell in week 45 1999

Treatment	Length cm	Number of Branches	Fresh weight In g	Dry weight In g	Quality of Root
1. Control	54,1	3,95	69,7	31,8	3,7
2. 10 vol.Fyt	55,2	4,28	64,5	29,6	4,3
3. 20 vol Fyt	54,0	4,33	68,4	29,3	4,4
4. 30 vol Fyt	55,5	4,70	69,8	27,6	4,4

By applying Fytocell the number of branches increases and the quality of the root improves. More young active, healthy roots were observed.

Table 12 B.2.3 Crop Chamaecyparis nootkatensis 'Glauca' in potting soil with Fytocell, Boskoop. Week 45, 1999.

Treatment	Lava floor - Fytocell	Lava floor + Fytocell	Concrete - Fytocell	Concrete + Fytocell
Length in cm	66	67	63	65
Fresh weight in g	287	284	248	255
Quality of Root(1-5)	3,8	4,3	3,0	3,4

By applying Fytocell the root quality is positively influenced. By adding Fytocell a higher air rate in the potting soil results in more and healthier roots reaching to the bottom of the container.

Table 13 B.2.3 Crop Chamaecyparis nootkatensis 'Aurea' in potting soil with Fytocell, Research Station, Boskoop. Week 45 1999.

Treatment	Lava Floor - Fytocell	Lava Floor + Fytocell	Concrete - Fytocell	Concrete + Fytocell
Length in cm	55,5	56,6	52,9	55,8
Fresh weight in g	235	224	224	258
Quality of Root(1-5)	3,2	3,7	2,2	3,0

By adding Fytocell the quality of the roots increases. This crop is more sensitive to (oxygen) lack of air than the Chamaecyparis nootkatensis 'Glauca'.

Plant hole treatment – Research Station, Zundert

An increase in available nutrient elements, especially nitrogen and potassium is recorded due to the addition of Fytocell. The pH reduced in the lime sandy soil with 0,5 units. It may be necessary to compensate this by adding lime.
The % fine particles < 50 mu increased with 2-weight % per 10-volume% Fytocell. With Fytocell in the plant hole the amount of moisture increases with 5 to 6 volume% per 10-volume % Fytocell in the mixture. The moist and dry bulk weight reduces by adding Fytocell. For moist this is approximately 1.6 weight % per 10 volume % Fytocell and for the dry weight approximately 3 weight %.
By using Fytocell the resistance or strength is lowered. In week 44 the soil has more resistance than in week 20.

Cultivated soil - Boot, Zundert

An increase was recorded in moisture volume % of approximately 8% per 10 volumes Fytocell. The moist and dry bulk weight reduced with respectively 4 and 6-weight % per 10-volume % Fytocell.
The strength or resistance of the soil decreases by using Fytocell. The plants are longer and the fresh and dry weight higher. The root quality received a higher rating by using Fytocell.

In Potting Soil – Research Station, Boskoop

By mixing Fytocell with peat the air rating in the potting soil increased. The moisture availability was only slightly reduced. By using Fytocell the root quality improved. Fytocell has a low pH and an addition of lime is required: 3 – 4 kg carbonic acid magnesia lime per m3 Fytocell. It is advised not to add Pg-mix for the volume part of the Fytocell in connection with the greater availability of nutrient elements by using Fytocell.
The Buddleja had more branches and a better root system by using Fytocell in the potting soil. Chamaecyparis nootkatensis had a better root rating by using Fytocell.

Appendix: 1 t / m 33

Appendix 1 Project 1333: Results of N-Mineral Research 1999

Date Sample	Treatment	NH4-N mg/l	NO3-N mg/l	K mg/l	Nitrogen	K20
27/5/97	Boot 1	<0.5	12.3	213	74	1540
27/5/97	Boot 2	1	17.9	237	113	1714
27/5/97	Boot3	5.9	11	209	101	1511
27/5/97	Plant holeA	<0.5	1.6	23.6	10	171
27/5/97	Plant holeB	1.8	13.5	27.5	92	199
27/5/97	Plant holeC	1.3	24.4	40.8	154	295

Project 1333: Results of Granular Research

Date: 27/5/99

Analysis	Boot 1	Boot 2	Boot 3	Plant hole A	Plant hole B	Plant hole C
PH-KCl	7	7	6.5	4.6	4.1	4.1
Moist*	0.82	1.17	0.73	0.36	0.41	0.45
Organic Matter **	3.1	4.9	3.7	1	1	1.3
CaCO3 **	0	0	0	0	0	0
Soil Particles <16µ **	4.4	4.2	3.8	3.7	5.3	5.9
Total sand **	92.5	90.9	92.5	95.3	93.7	92.8
Granular						
0-2mm***	3	3.1	2.7	3.2	4.4	4.8
2-16mm***	1.6	1.3	1.2	0.6	0.9	1.2
16-50mm***	7.8	7.6	9	9.6	11.3	13.6
50-105mmv***	18.9	19.1	18	26.7	24.9	24.3
105-150mm***	24	24	23.3	24.1	21.9	21.7
150-210mm***	25.1	24.7	25.5	20.8	20.9	20.6
210-300mm***	14.2	13.7	13.9	10.3	10.5	9.7
300-2000mm***	5.4	0.5	6.4	4.7	5.2	4.1

*g/100g air dry
**g/100g dry weight
***% of the mineral particles

Project 1333: Results of Fertilization

Date: 27/5/99 Treatments

Analysis	Boot 1	Boot 2	Boot 3	Plant hole A	Plant hole B	Plant hole C
PH-KCl	6.1	6.7	6.4	5.1	4.2	4.2
Organic Matter **	3.4	4.9	4.2	1.2	1.4	1.5
Phosphate Pw*	70	95	104	65	96	101
Phosphate PAI **	66	103	87	33	35	37
Kali K-HCl ***	62	77	69	12	13	14
Megn MgO-NaCl ****	121	203	181	65	95	100

*mg P205/litre soil
** mg P205/100g dry soil
*** mg K20/100g dry soil
**** mg MgO/Kg dry soil Sample layer 30cm

Appendix 2

Plant hole treatment for 'street trees'on sandy soil

Project 1333

Surface sagging in the plant holes in mm

	week 20	1999					Average	
A1	6	8	5	7	6	32	6,4	
A2	8	12	4	7	8	39	7,8	
A3	6	5	5	7	8	31	6,2	6,8
B1	12	7	5	10	10	44	8,8	
B2	9	8	12	12	13	54	10,8	
B3	8	10	7	10	11	46	9,2	9,6
C1	12	11	8	13	13	57	11,4	
C2	7	9	8	7	9	40	8	
C3	12	10	11	12	9	54	10,8	9,7
	week 32							
A1	23	18	20	30	40	131	26,2	
A2	26	20	25	28	40	139	27,8	
A3	21	17	18	20	30	106	21,2	25,1
B1	33	20	15	26	50	144	28,8	
B2	22	32	30	36	45	165	33	
B3	41	26	23	23	25	138	27,6	29,8
C1	30	32	34	50	60	206	41,2	
C2	35	23	27	35	50	170	34	
C3	100	90	90	100	110	490	98	37,6*
	week 44					* excluding C3		
A1	35	28	20	18	26	127	25,4	
A2	35	30	30	35	45	175	35	
A3	36	25	23	23	35	142	28,4	29,6
B1	43	35	22	23	35	158	31,6	
B2	13	18	25	30	42	128	25,6	
B3	25	34	26	30	40	155	31	29,4
C1	70	55	43	40	37	245	49	
C2	65	40	25	27	41	198	39,6	
C3	100	72	75	85	75	407	81,4	44,3**
						** excluding C3		

C3 was not used in the observation in week 32 and 44 due to unexplainable large sagging

REMARK: During filling the soil was not pressed down (compressed)

Appendix 3

1333 Fytocell as soil improving material in the plant hole

Samples taken in week 20, 1999 20 1999

Field no.	Ring no.	weight ring in gr.	weight plastic bag	tot. Incl.ring soil + water & plastic bag	tot. Incl. ring dry weight	Soil Moist g/100cm3	Soil Dry g/100cm3	Moist Volume %	Average Moist Volume %	Moist Bulk weight g/100cm3	Dry Bulk weight g/100cm3
A1a	48	91,06	3,15	273,91	247,05	179,7	155,99	23,71			
A1b	35	90,7	3,15	266,92	241,21	173,07	150,51	22,56			
A1c	27	91,24	3,15	268,39	242,61	174	151,37	22,63			
A2a	3	90,59	3,15	261,09	233,4	167,35	142,81	24,54			
A2b	16	91,19	3,15	268,79	243,99	174,45	152,8	21,65			
A2c	12	91,03	3,15	266,57	242,87	172,39	151,84	20,55			
A3a	38	91,55	3,15	266,21	242,43	171,51	150,88	20,63			
A3b	36	91,76	3,15	264,27	240,63	169,36	148,87	20,49			
A3c	28	91,52	3,15	267,28	243,21	172,61	151,69	20,92	22,0	172,7	150,8
B1a	4	90,15	3,15	251,84	227,85	158,54	137,7	20,84			
B1b	9	90,21	3,15	250,21	226,83	156,85	136,62	20,23			
B1c	37	91,62	3,15	258,8	234,79	164,03	143,17	20,86			
B2a	24	90,08	3,15	255,12	232,69	161,89	142,61	19,28			
B2b	15	90,89	3,15	257,93	235,07	163,89	144,18	19,71			
B2c	17	90,51	3,15	259,91	236,61	166,25	146,1	20,15			
B3a	42	90,36	3,15	260,02	236,31	166,51	145,95	20,56			
B3b	30	90,98	3,15	257,77	234,84	163,64	143,86	19,78			
B3c	45	90,85	3,15	261	236,3	167	145,45	21,55	20,3	163,2	142,8
C1a	50	91,27	3,15	253,86	231,14	159,44	139,87	19,57			
C1b	41	91,02	3,15	248,38	226,51	154,21	135,49	18,72			
C1c	2	91,2	3,15	247,09	225,81	152,74	134,61	18,13			
C2a	43	91,52	3,15	251	226,7	156,44	135,18	21,26			
C2b	20	90,38	3,15	249,52	224,99	155,99	134,61	21,38			
C2c	7	91,16	3,15	246,73	222,7	152,42	131,54	20,88			
C3a	47	91,8	3,15	256,26	233,63	161,31	141,83	19,48			
C3b	46	90,79	3,15	254,2	231,21	160,26	140,42	19,84			
C3c	5	90,98	3,15	252,61	231,14	158,48	140,16	18,32	19,7	156,8	137,1

Appendix 4

1333 Fytocell as soil improving material in the plant hole

Ring sample from 100 cm3 taken on 23 August, 1999 week 34

Field no.	Ring no.	weight ring in gr.	weight plastic bag	tot. Incl.ring soil + water & plastic bag	Incl. Ring petri. dry weight	weight petri.	Soil Moist g/100cm3	Soil Dry g/100cm3	Moist Volume %	Average Moist Volume %	Moist Bulk weight g/100cm3	Dry Bulk weight g/100cm3
A1a	12	91,03	3,15	256,45	287,01	46,01	162,27	146,82	15,45			
A1b	3	90,59	3,15	257,91	295,54	53,41	164,17	148,39	15,78			
A1c	27	91,24	3,15	256,57	290,58	49,86	162,18	146,33	15,85			
A2a	14	90,65	3,15	249,48	281,08	44,77	155,68	142,51	13,17			
A2b	7	91,16	3,15	256,29	294,6	54,17	161,98	146,12	15,86			
A2c	35	90,7	3,15	252,2	284,8	46,68	158,35	144,27	14,08			
A3a	49	90,91	3,15	255,86	287,6	48,58	161,8	144,96	16,84			
A3b	32	91,47	3,15	255,8	292,8	52,17	161,18	146,01	15,17			
A3c	19	90,43	3,15	255,43	288,59	48,95	161,85	146,06	15,79	15,3	161,1	145,7
B1a	10	90,02	3,15	247,36	273,08	43,57	154,19	136,34	17,85			
B1b	48	91,06	3,15	257,58	285,42	45,79	163,37	145,42	17,95			
B1c	45	90,85	3,15	255,77	279,16	40,81	161,77	144,35	17,42			
B2a	1	89,77	3,15	252,24	286,47	51,66	159,32	141,89	17,43			
B2b	41	91,02	3,15	249,87	282,69	49,34	155,7	139,18	16,52			
B2c	24	90,08	3,15	254,2	285,31	49,04	160,97	143,04	17,93			
B3a	46	90,79	3,15	255,81	281,46	44,58	161,87	142,94	18,93			
B3b	2	91,2	3,15	252,31	283,23	48,12	157,96	140,76	17,2			
B3c	43	91,52	3,15	256,04	284,54	46,8	161,37	143,07	18,3	17,7	159,6	141,9
C1a	50	91,27	3,15	247,96	274,52	43,37	153,54	136,73	16,81			
C1b	9	90,21	3,15	245,84	282,09	53,18	152,48	135,55	16,93			
C1c	40	91,53	3,15	243,7	275,2	48,82	149,02	131,7	17,32			
C2a	36	91,76	3,15	250,09	268,17	36,75	155,18	136,51	18,67			
C2b	20	90,38	3,15	247,76	282,42	53,57	154,23	135,32	18,91			
C2c	23	90,46	3,15	246,52	275,01	47,59	152,91	133,81	19,1			
C3a	5	90,98	3,15	248,87	285,71	53,37	154,74	138,21	16,53			
C3b	47	91,8	3,15	248,95	281,04	49,42	154	136,67	17,33			
C3c	22	90,71	3,15	249,05	281,76	49,11	155,19	138,79	16,4	17,6	153,5	135,9

Appendix 5

1333 Fytocell as soil improving material in the plant holes of 'street trees'

Ring sample of 100 cm3 — 2-11-1999 week 44

Field no.	Ring no.	weight ring in gr.	weight plastic bag	tot. Incl.ring soil + water & plastic bag	Incl. ring & petri. dry weight	weight petri.	Soil Moist	Soil Dry	Moist Volume %	Average Moist Volume %	Moist Bulk weight g/100cm3	Dry Bulk weight g/100cm3
A1a	19	90,43	3,15	258,08	284,11	46,82	164,5	146,9	17,6			
A1b	21	90,19	3,15	264,18	288,55	46,03	170,84	152,3	18,5			
A1c	15	90,89	3,15	256,31	284,65	48,62	162,27	145,1	17,1	17,8		
A2a	11	90,63	3,15	259,75	289,75	49,06	165,97	150,1	15,9			
A2b	32	91,47	3,15	265,22	296,86	51,69	170,6	153,7	16,9			
A2c	9	90,21	3,15	261,67	289,11	47,31	168,31	151,6	16,7	16,5		
A3a	26	90,97	3,15	260,99	289,27	49,42	166,87	148,9	18,0			
A3b	1	89,77	3,15	258,15	285,29	47,59	165,23	147,9	17,3			
A3c	4	90,15	3,15	260,65	290,21	50,02	167,35	150,0	17,3	17,5	166,9	149,6
B1a	33	91,19	3,15	260,04	286,13	49,1	165,7	145,8	19,9			
B1b	3	90,59	3,15	258,33	279,39	44,79	164,59	144,0	20,6			
B1c	43	91,52	3,15	256,6	280,78	46,35	161,93	142,9	19,0	19,8		
B2a	22	90,71	3,15	258,64	290,56	53,57	164,78	146,3	18,5			
B2b	17	90,51	3,15	257,08	274,08	38,56	163,42	145,0	18,4			
B2c	7	91,16	3,15	256,57	280,4	44,95	162,26	144,3	18,0	18,3		
B3a	38	91,55	3,15	251,09	281,59	51,06	156,39	139,0	17,4			
B3b	12	91,03	3,15	257,44	285,74	49,87	163,26	144,8	18,4			
B3c	36	91,76	3,15	261,26	289,33	50,95	166,35	146,6	19,7	18,5	163,2	144,3
C1a	41	91,02	3,15	250,12	286,2	57,12	155,95	138,1	17,9			
C1b	23	90,46	0	249,33	280,65	52,12	158,87	138,1	20,8			
C1c	5	90,98	0	253,85	287,38	53,38	162,87	143,0	19,9	19,5		
C2a	10	90,02	0	250,3	275,64	46,68	160,28	138,9	21,3			
C2b	40	91,53	0	245,43	269,42	44,56	153,9	133,3	20,6			
C2c	31	90,36	0	239,04	268,26	48,55	148,68	129,4	19,3	20,4		
C3a	13	90,38	0	242,21	279,78	54,42	151,83	135,0	16,9			
C3b	37	91,62	0	247,73	278,51	49,3	156,11	137,6	18,5			
C3c	34	91,63	0	244,97	282,21	53,37	153,34	137,2	16,1	17,2	155,8	136,7

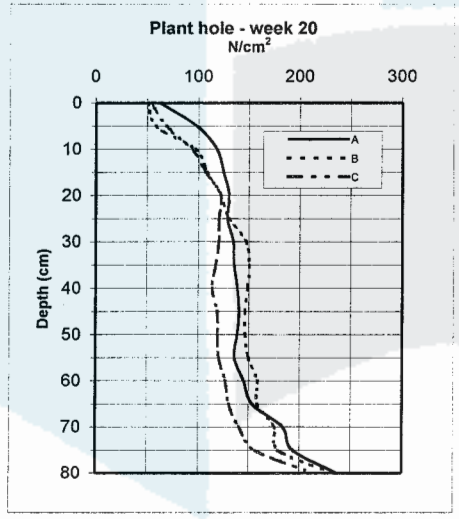
Appendix 6

1333 Fytocell as soil improving material used in the plant holes of 'street trees'

Strength or resistance measurements - plant hole in N/cm2, week 20, 1999

Depth in cm	A1	A2	A3	Average.A	Standard Deviation	B1	B2	B3	Average.B	Standard Deviation	C1	C2	C3	Average.C	Standard Deviation
0	55	65	65	61,7	5,8	45	50	55	50,0	5,0	45	60	55	53,3	7,6
5	99	100	95	98,0	2,6	45	70	60	58,3	12,6	60	65	80	68,3	10,4
10	110	112	130	117,3	11,0	50	125	115	96,7	40,7	75	105	100	93,3	16,1
15	113	120	140	124,3	14,0	65	130	130	108,3	37,5	80	130	110	106,7	25,2
20	110	130	150	130,0	20,0	70	155	140	121,7	45,4	95	130	140	121,7	23,6
25	100	140	145	128,3	24,7	90	150	150	130,0	34,6	90	125	145	120,0	27,8
30	120	142	140	134,0	12,2	130	150	160	146,7	15,3	90	125	145	120,0	27,8
35	125	140	140	135,0	8,7	140	150	160	150,0	10,0	95	125	130	116,7	18,9
40	130	145	140	138,3	7,6	145	150	150	148,3	2,9	95	120	125	113,3	16,1
45	135	145	140	140,0	5,0	145	153	140	146,0	6,6	95	120	140	118,3	22,5
50	135	145	135	138,3	5,8	150	153	135	146,0	9,6	112	120	125	119,0	6,6
55	138	148	120	135,3	14,2	153	155	140	149,3	8,1	120	120	120	120,0	0,0
60	154	150	130	144,7	12,9	155	160	160	158,3	2,9	130	130	120	126,7	5,8
65	180	150	130	153,3	25,2	155	160	160	158,3	2,9	135	130	125	130,0	5,0
70	215	165	170	183,3	27,5	175	170	180	175,0	5,0	150	140	130	140,0	10,0
75	220	180	180	193,3	23,1	178	180	180	179,3	1,2	160	170	140	156,7	15,3
80	228	240	240	236,0	6,9	250	200	250	233,3	28,9	220	240	180	213,3	30,6

Depth in cm	Average.A	Average.B	Average.C
0	61,7	50,0	53,3
5	98,0	58,3	68,3
10	117,3	96,7	93,3
15	124,3	108,3	106,7
20	130,0	121,7	121,7
25	128,3	130,0	120,0
30	134,0	146,7	120,0
35	135,0	150,0	116,7
40	138,3	148,3	113,3
45	140,0	146,0	118,3
50	138,3	146,0	119,0
55	135,3	149,3	120,0
60	144,7	158,3	126,7
65	153,3	158,3	130,0
70	183,3	175,0	140,0
75	193,3	179,3	156,7
80	236,0	233,3	213,3



Appendix 7

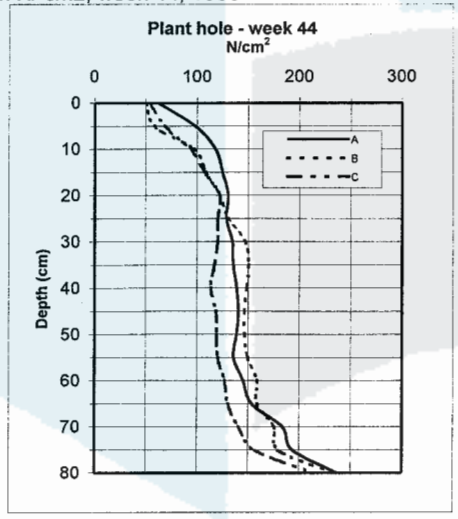
1333 Fytocell as a soil improving material in the plant holes of 'street trees

Strength or resistance measurements in the plant hole in N/5 cm2, week 44, 1999

Depth in cm	A1	A2	A3	Average.A	Standard Deviation	B1	B2	B3	Average.B	Standard Deviation	C1	C2	C3	Average.C	Standard Deviation
0	200	200	165	188,3	20,2	125	140	100	121,7	20,2	120	105	115	113,3	7,6
5	250	210	190	216,7	30,6	130	165	100	131,7	32,5	125	120	130	125,0	5,0
10	240	220	170	210,0	36,1	135	185	130	150,0	30,4	130	125	150	135,0	13,2
15	200	200	165	188,3	20,2	155	190	150	165,0	21,8	135	135	170	146,7	20,2
20	185	195	150	176,7	23,6	160	175	155	163,3	10,4	155	135	165	151,7	15,3
25	175	190	155	173,3	17,6	160	160	160	160,0	0,0	160	125	150	145,0	18,0
30	150	180	155	161,7	16,1	180	150	160	163,3	15,3	150	125	155	143,3	16,1
35	155	170	160	161,7	7,6	185	160	145	163,3	20,2	145	125	150	140,0	13,2
40	160	170	165	165,0	5,0	185	170	135	163,3	25,7	140	125	155	140,0	15,0
45	170	190	165	175,0	13,2	190	230	130	183,3	50,3	135	125	160	140,0	18,0
50	175	205	180	186,7	16,1	190	215	130	178,3	43,7	135	140	165	146,7	16,1
55	185	230	190	201,7	24,7	185	190	150	175,0	21,8	130	150	155	145,0	13,2
60	210	230	190	210,0	20,0	190	180	150	173,3	20,8	140	160	155	151,7	10,4
65	220	225	200	215,0	13,2	190	180	180	183,3	5,8	160	175	170	168,3	7,6
70	220	250	210	226,7	20,8	200	185	225	203,3	20,2	215	210	200	208,3	7,6
75	250	300	230	260,0	36,1	270	250	290	270,0	20,0	300	290	280	290,0	10,0
80	300	300	300	300,0	0,0	350	300	350	333,3	28,9	350	340	310	333,3	20,8

Strength or resistance measurements in the plant hole in N/ cm2, week 44, 1999

Depth in cm	Average.A	Average.B	Average.C
0	61,7	50,0	53,3
5	98,0	58,3	68,3
10	117,3	96,7	93,3
15	124,3	108,3	106,7
20	130,0	121,7	121,7
25	128,3	130,0	120,0
30	134,0	146,7	120,0
35	135,0	150,0	116,7
40	138,3	148,3	113,3
45	140,0	146,0	118,3
50	138,3	146,0	119,0
55	135,3	149,3	120,0
60	144,7	158,3	126,7
65	153,3	158,3	130,0
70	183,3	175,0	140,0
75	193,3	179,3	156,7
80	236,0	233,3	213,3

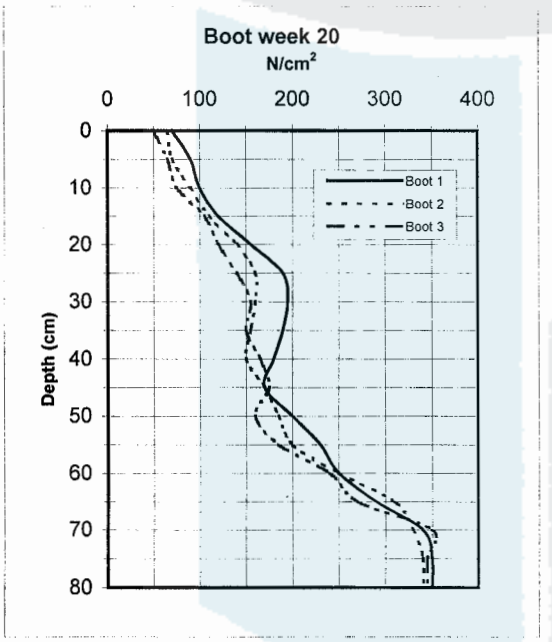


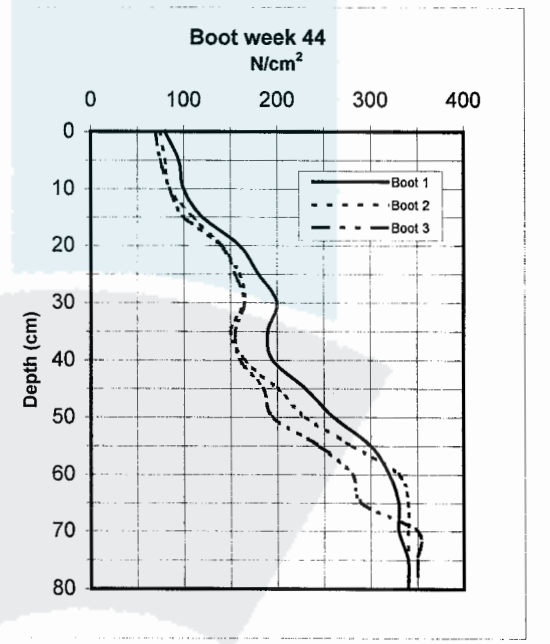
Appendix 8

FYTOCELL as soil improving material used in the soil for tree Nursery crops

Strength or resistance in the soil at Boot & Co. in N/cm2, 1999

Depth in cm	n=5 Boot 1 week 20	Boot 2 week 20	Boot 3 week 20	n=5 Boot 1 week 44	Boot 2 week 44	Boot 3 week 44
0	70	65	50	80	75	70
5	90	70	65	95	80	75
10	100	90	75	100	85	85
15	120	110	105	120	110	100
20	155	140	120	160	140	140
25	190	160	140	180	160	155
30	195	160	155	200	165	165
35	190	155	150	190	150	155
40	180	150	165	195	165	160
45	170	170	175	230	200	185
50	200	185	160	260	230	195
55	230	200	185	300	280	245
60	250	250	240	320	330	280
65	290	310	270	330	340	290
70	340	330	350	330	340	350
75	350	340	345	340	340	350
80	350	340	345	340	340	350





Research on FYTOCELL as soil improving material

Appendix 9

1333 Fytocell as soil improving material on sandy soil **Boot en Co**

Ring samples from 100 cm3 taken in week 20, 1999

Field no.	Ring no.	weight ring	plastic bag	Soil, ring plastic moist weight	weight ring/dry	Soil Moist g/100cm3	Soil Dry g/100cm3	Moist Volume %	Average Moist Volume %	Moist Bulk weight g/100cm3	Dry Bulk weight g/100 cm3
1a1	23	90,41	3,15	271,53	242,64	177,97	152,23	25,74			
1a2	22	90,69	3,15	259,7	232,44	165,86	141,75	24,11			
1a3	6	90,57	3,15	258,63	226,98	164,91	136,41	28,5			
1a4	14	90,63	3,15	258,36	228,98	164,58	138,35	26,23			
1a5	44	90,43	3,15	259,83	230,65	166,25	140,22	26,03	26,122	167,914	141,792
2a1	31	90,32	3,15	255,9	221,83	162,43	131,51	30,92			
2a2	34	91,58	3,15	242,81	207,79	148,08	116,21	31,87			
2a3	29	90,97	3,15	238,64	200,62	144,52	109,65	34,87			
2a4	13	90,33	3,15	242,82	208,73	149,34	118,4	30,94			
2a4	18	91,32	3,15	258,15	227,44	163,68	136,12	27,56	31,232	153,61	122,378
3a1	11	90,6	3,15	250,21	217,63	156,46	127,03	29,43			
3a2	26	90,93	3,15	246,32	211,67	152,24	120,74	31,5			
3a3	33	91,13	3,15	244,67	208,61	150,39	117,48	32,91			
3a4	25	90,5	3,15	238,56	203,51	144,91	113,01	31,9			
3a5	40	91,49	3,15	246,73	213,23	152,09	121,74	30,35	31,218	151,218	120

NB. No petri. Dish used!

Appendix 10

1333 Fytocell as soil improving material on sandy soil **Boot en Co**

Ring samples from 100 cm3 taken in week 32, 1999

Field no.	Ring no.	weight ring	plastic bag	Soil, ring plastic moist weight	weight ring/dry incl.petri.	weight petri.	Soil Moist g/100cm3	Soil Dry g/100cm3	Moist Volume %	Average Moist Volume %	Moist Bulk weight g/100cm3	Dry Bulk weight g/100 cm3
1a1	26	90,97	3,15	250,54	276,32	50,12	156,42	135,23	21,19			
1a2	42	90,36	3,15	246,43	270,19	45,73	152,92	134,1	18,82			
1a3	38	91,55	3,15	250	269,47	42,18	155,3	135,74	19,56			
1a4	37	91,62	3,15	255,1	281,43	49,13	160,33	140,68	19,65			
1a5	15	90,89	3,15	244,95	266,07	45,37	150,91	129,81	21,1	20,064	155,176	135,112
2a1	25	90,53	3,15	241,8	260,21	45,09	148,12	124,59	23,53			
2a2	17	90,51	3,15	240,83	269,96	54,95	147,17	124,5	22,67			
2a3	28	91,52	3,15	244,68	267,9	49,23	150,01	127,15	22,86			
2a4	33	91,19	3,15	246,77	273,95	52,29	152,43	130,47	21,96			
2a5	34	91,63	3,15	231,77	258	51,75	136,99	114,62	22,37	22,678	146,944	124,266
3a1	44	90,46	3,15	243,68	252,94	44,09	150,07	118,39	31,68			
3a2	6	90,57	3,15	241,94	254,67	44,04	148,22	120,06	28,16			
3a3	29	91	3,15	243,96	262,28	49,97	149,81	121,31	28,5			
3a4	33	91,19	3,15	240,94	253,55	45,31	146,6	117,05	29,55			
3a5	21	90,19	3,15	241,95	260,75	50,32	148,61	120,24	28,37	29,252	148,662	119,41

Appendix 11

1333 Fytocell as soil improving material on sandy soil **Boot en Co**

Ring samples from 100 cm3 taken in week 44, 1999

Field no.	Ring no.	weight ring	plastic bag	soil, ring plasticbag moist weight	weight ring/dry incl.petri.	weight petri.	Soil Moist g/100cm3	Soil Dry g/100cm3	Moist Volume %	Average Moist Volume %	Moist Bulk weight g/100cm3	Dry Bulk weight g/100 cm3
1a1	2	91,2	3,15	261,82	278,67	44,7	167,47	142,77	24,7			
1a2	6	90,57	3,15	267,4	283,15	41,02	173,68	151,56	22,12			
1a3	46	90,79	3,15	259,22	285,1	52,31	165,28	142	23,28			
1a4	30	90,98	3,15	252,92	275,86	49,52	158,79	135,36	23,43			
1a5	14	90,65	3,15	254,85	275,16	46,96	161,05	137,55	23,5	23,4	165,3	141,8
2a1	48	91,06	3,15	235,96	255,51	48,14	141,75	116,31	25,44			
2a2	45	90,85	3,15	248,26	264,82	46,01	154,26	127,96	26,3			
2a3	28	91,52	3,15	245,78	257,75	43,39	151,11	122,84	28,27			
2a4	27	91,24	3,15	244,24	261,25	48,8	149,85	121,21	28,64			
2a5	50	91,27	3,15	241,63	260,29	48,5	147,21	120,52	26,69	27,1	148,8	121,8
3a1	29	91	3,15	235,57	238,56	36,77	141,42	110,79	30,63			
3a2	20	90,38	3,15	244,57	258,19	45,75	151,04	122,06	28,98			
3a3	49	90,91	3,15	234,1	246,4	42,91	140,04	112,58	27,46			
3a4	47	91,8	3,15	247,9	264,14	48,83	152,95	123,51	29,44			
3a5	42	90,36	3,15	232,96	254,7	53,2	139,45	111,14	28,31	29,0	145,0	116,0

Appendix 12 **Fytocell as soil improving material on sandy soil**

Project 1333 Length of Plant Boot en Co week 20 1999,0

Plant number	Amelanchier Amel. 0%	Amel. 0%	Amel. 0%	Amel. 12,50%	Amel. 12,50%	Amel. 12,50%	Amel. 25%	Amel. 25%	Amel. 25%	Pinus 12,50%	Pinus 25%
1	43,0	30,0	50,0	48,0	40,0	50,0	50,0	53,0	56,0	75,0	70,0
2	47,0	28,0	40,0	50,0	43,0	52,0	43,0	55,0	60,0	75,0	77,0
3	45,0	30,0	40,0	50,0	44,0	54,0	52,0	56,0	60,0	76,0	90,0
4	47,0	38,0	38,0	45,0	48,0	53,0	52,0	48,0	58,0	84,0	78,0
5	45,0	34,0	34,0	43,0	40,0	50,0	53,0	55,0	54,0	73,0	78,0
6	42,0	40,0	36,0	43,0	44,0	48,0	54,0	53,0	70,0	70,0	85,0
7	45,0	36,0	36,0	42,0	45,0	54,0	48,0	55,0	65,0	78,0	85,0
8	40,0	38,0	36,0	43,0	48,0	53,0	45,0	50,0	55,0	75,0	75,0
9	38,0	30,0	34,0	52,0	48,0	50,0	43,0	54,0	62,0	78,0	80,0
10	42,0	34,0	28,0	54,0	47,0	52,0	60,0	52,0	54,0	80,0	76,0
11	47,0	30,0	28,0	58,0	46,0	52,0	60,0	48,0	60,0	70,0	84,0
12	48,0	45,0	30,0	54,0	50,0	50,0	60,0	53,0	55,0	70,0	68,0
13	52,0	48,0	30,0	52,0	53,0	51,0	60,0	58,0	54,0	80,0	80,0
14	50,0	44,0	32,0	54,0	52,0	54,0	61,0	60,0	50,0	72,0	76,0
15	50,0	40,0	35,0	48,0	48,0	55,0	43,0	55,0	50,0	74,0	76,0
16	45,0	48,0	34,0	52,0	48,0	54,0	50,0	55,0	45,0	80,0	70,0
17	48,0	44,0	40,0	52,0	50,0	48,0	50,0	60,0	55,0	77,0	80,0
18	59,0	40,0	38,0	54,0	54,0	52,0	50,0	60,0	55,0	90,0	82,0
19	40,0	40,0	42,0	50,0	50,0	50,0	52,0	54,0	58,0	85,0	70,0
20	38,0	30,0	34,0	50,0	53,0	53,0	52,0	60,0	54,0	84,0	70,0
21	34,0	38,0	32,0	54,0	51,0		53,0	60,0	58,0	70,0	83,0
22	33,0	38,0	34,0	53,0	52,0		51,0	52,0	55,0	72,0	82,0
23	38,0	48,0	36,0	50,0	48,0		54,0	58,0	56,0	75,0	86,0
24	40,0	40,0	35,0	53,0	50,0		48,0	63,0	55,0	76,0	78,0
25	43,0	42,0	34,0	53,0	55,0		52,0	70,0	58,0	74,0	84,0
26	36,0	45,0	34,0	45,0	48,0		50,0	63,0	45,0	78,0	77,0
27	40,0	44,0	38,0	50,0	53,0		55,0	62,0	48,0	78,0	82,0
28	43,0	42,0	33,0	44,0	52,0		48,0	54,0	50,0	85,0	80,0
29	48,0	40,0	35,0	48,0	48,0		52,0	50,0	54,0	70,0	76,0
30	48,0	42,0	45,0	55,0	47,0		54,0	50,0	52,0	75,0	73,0
	1314,0	1166,0	1071,0	1499,0	1455,0	1035,0	1555,0	1676,0	1661,0	2299,0	2351,0
	43,8	38,9	35,7	50,0	48,5	51,8	51,8	55,9	55,4	76,6	78,4
Average length		39,51 cm			50,1 cm		53,15 cm			76,63 cm	78,37 cm
In %		100%			128%		135%			100%	102%

Research on FYTOCELL as soil improving material

Appendix 13 **Fytocell as soil improving material on sandy soil**

Project 1333 Length of Plant Boot en Co week 32 1999

	Amelanchier	Amel.	Amel.	Amel.	Amel.	Amel.	Amel.	Amel.	Amel.	Pinus	Pinus
	0%	0%	0%	12,5%	12,5%	12,5%	25%	25%	25%	12,5%	25%
1	83	61	87	112	106	123	107	95	114	81	95
2	84	78	82	94	105	120	112	118	116	80	79
3	86	74	72	113	104	120	125	120	117	75	79
4	76	72	66	103	97	85	109	118	119	88	92
5	69	75	64	91	118	118	124	107	110	80	87
6	84	81	52	109	120	110	112	115	115	71	77
7	94	63	65	95	120	120	108	120	140	82	79
8	50	54	54	110	94	117	103	123	118	77	81
9	85	50	69	115	105	111	117	125	120	85	89
10	77	68	51	106	113	112	126	115	120	85	65
11	95	63	52	116	121	118	114	106	98	74	86
12	66	63	57	120	110	104	124	116	115	79	75
13	66	64	63	99	125	115	104	125	120	84	91
14	72	65	47	93	124	120	112	120	106	73	82
15	67	55	60	116	120	118	115	124	111	79	85
16	63	62	74	105	116	120	112	107	110	78	82
17	71	70	59	110	130	130	130	114	120	73	77
18	72	55	63	115	115	123	115	125	105	95	78
19	63	63	58	110	120	123	100	140	94	83	90
20	67	69	59	108	110	124	110	130	105	85	90
21	49	52	57	113	108		103	125	120	73	83
22	62	59	55	120	120		115	125	106	75	82
23	52	72	59	119	130		119	123	123	78	86
24	53	71	52	127	120		105	125	120	76	84
25	45	65	51	120	125		102	124	99	79	85
26	43	62	52	112	120		106	122	104	83	79
27	62	74	58	120	122		107	110	117	79	84
28	82	50	66	117	115		113	130	106	86	75
29	64	52	49	109	124		119	117	88	72	85
30	64	65	60	123	107		125	108	106	79	84
	2066	1927	1813	3320	3464	2331	3393	3572	3362	2387	2486
	68,87	64,23	60,43	110,67	115,47	116,55	113,1	119,07	112,07	79,57	82,87
Average in cm		64,51			115,04			114,75		79,57	82,87
In %		100%			178,32%			177,89%		100%	104,10%

Research on FYTOCELL as soil improving material

Appendix 14 **Fytocell as soil improving material on sandy soil**

Project 1333 Length of Plant in cm Boot en Co week 44 1999

	Amelanchier	Amel.	Amel.	Amel.	Amel.	Amel.	Amel.	Amel.	Amel.	Pinus	Pinus
	0%	0%	0%	12,5%	12,5%	12,5%	25%	25%	25%	12,5%	25%
1	81	59	85	105	104	123	115	125	104	80	78
2	84	77	65	110	105	119	104	93	114	82	98
3	85	75	71	92	106	123	115	120	113	78	78
4	75	72	64	113	103	81	125	115	115	90	81
5	65	74	62	103	98	118	107	116	108	80	93
6	82	78	48	89	118	108	122	106	103	71	87
7	92	63	62	109	120	123	116	116	119	85	77
8	67	55	54	93	118	115	111	124	120	82	82
9	83	50	67	108	93	111	100	121	111	85	81
10	75	67	47	111	104	106	116	125	118	86	88
11	95	61	48	106	113	120	130	115	118	83	65
12	61	68	56	112	119	105	114	110	97	80	87
13	65	66	65	118	105	107	129	116	114	88	76
14	73	65	46	99	130	123	99	128	120	78	93
15	68	53	70	95	118	119	113	120	106	82	80
16	56	62	71	116	121	130	114	123	107	83	82
17	74	75	57	100	114	130	115	104	108	73	74
18	71	51	63	110	137	124	124	113	119	97	72
19	62	60	59	117	114	127	111	120	110	85	88
20	64	64	60	107	118	125	99	140	97	88	89
21	49	51	59	101	107		109	130	104	71	84
22	59	56	54	111	111		98	125	121	77	82
23	50	70	60	110	121		115	129	106	83	86
24	51	69	51	119	126		120	124	120	80	82
25	43	60	47	123	123		105	124	120	82	83
26	45	61	56	117	125		103	125	98	88	81
27	56	75	57	109	120		103	122	100	82	83
28	83	45	65	118	126		103	110	116	90	72
29	65	50	40	117	123		112	130	103	72	84
30	61	65	63	106	126		118	118	88	82	81
	2040	1897	1772	3244	3466	2337	3365	3587	3297	2463	2467
	68,00	63,23	59,07	108,13	115,53	116,85	112,17	119,57	109,90	82,10	82,23
Average in cm		63,43 cm			113,4 cm			114,11		82,1	82,23
In %		100%			178,80%			179,90%		100%	104,10%

Research on Fytocell as soil improving material

Appendix 15 **Project 1333** **Soil improving - Sandy Soil**

New length of shoot - Pinus Boot en Co week 44 1999

Plant no.	12,5% Fytocell					Average Shoot cm	25% Fytocell						
1	18	17	18	17	21	18,2	17	19	19	18	19	18,4	
2	21	19	20	21	17	19,6	17	22	22	20	19	20	
3	16	16	16	17	14	15,8	17	18	18	17	19	17,8	
4	17	16	16	17	14	16	17	14	15	21	18	17	
5	16	16	17	12	16	15,4	17	22	22	19	19	19,8	
6	10	12	11	13	11	11,4	17	18	17	17	17	17,2	
7	12	14	14	14	12	13,2	17	18	17	17	17	17,2	
8	17	15	13	14	14	14,6	17	19	17	18	19	18	
9	15	16	16	18	14	15,8	17	15	17	16	17	16,4	
10	16	16	16	17	17	16,4	17	20	24	22	19	20,4	
11	12	13	12	13	13	12,6	17	14	17	18	18	16,8	
12	17	15	16	19	15	16,4	17	21	22	20	20	20	
13	16	14	13	18	15	15,2	17	15	13	13	13	14,2	
14	14	14	13	15	12	13,6	17	14	15	17	16	15,8	
15	17	13	14	17	17	15,6	17	15	17	16	15	16	
16	16	15	13	16	16	15,2	17	15	16	15	12	15	
17	13	10	11	11	12	11,4	0	0	0	0	0	0	Top piece
18	14	13	15	16	15	14,6	17	17	19	20	19	18,4	
19	15	14	15	17	17	15,6	17	20	23	20	19	19,8	
20	17	16	15	18	18	16,8	17	19	18	17	18	17,8	
21	12	12	12	12	13	12,2	17	15	15	16	16	15,8	
22	14	15	14	15	15	14,6	17	14	13	14	15	14,6	
23	12	15	14	13	13	13,4	17	17	15	10	14	14,6	
24	14	16	15	12	16	14,6	17	15	16	18	18	16,8	
25	17	17	18	17	12	16,2	17	19	18	0	0	10,8	
26	21	25	24	24	23	23,4	17	16	15	17	17	16,4	
27	16	13	17	16	15	15,4	17	17	21	19	18	18,4	
28	17	18	17	18	18	17,6	17	14	14	15	11	14,2	
29	20	18	23	18	18	19,4	17	22	20	20	18	19,4	
30	18	16	15	16	17	16,4	17	16	19	20	15	17,4	
						466,6						494,4	
											29 plants		
				Average		15,55						17,048	

Increase in shoot length from 12,5 - 25%Fytocell 8,79%

Research on FYTOCELL as soil improving material

Appendix 16 **Soil improving Fytocell on sandy soil**

Project 1333 Boot en Co week 44 1999

Treatment	Amelanchier			
Vol% Fytocel	Fresh weight in grams			
0%	51,7			
0%	56,9			
0%	54,2	Average	54,3 g	100%
12,50%	166,9			
12,50%	103,2			
12,50%	110,6	Average	126,9 g	184%
25%	223,6			
25%	128,6			
25%	198,2	Average	183,5 g	338%

Treatment	Amelanchier			
Vol% Fytocel	Dry weight in grams			
0%	28,1			
0%	31,6			
0%	33,8	Average	31,2 g	100%
12,50%	93,8			
12,50%	55,8			
12,50%	59,3	Average	69,6 g	223%
25%	117,7			
25%	68,7			
25%	110,6	Average	99 g	317%

Appendix 17 Physical analysis of the potting soil research with FYTOCELL, 1999

06-08-1999

Order Number:	920.073	2670801
Research Number:	920.073	Research Station for Nursery Stock P.O. Box 118 2770 AC Boskoop

Copy sent to: BLGG Discount agreement, P.O. Box 115, 6860 AC Oosterbeek
Customer Reference: PROJECT 1333

SAMPLE DATA

Object Code:		Research Code:	920 physical
Date of Sampling:	15-07-1999	Sample Indication:	A FYTO 1
Date Received:	16-97-1999	Sampling done by:	not by BLGG

RESULTS OF ANALYSIS

Moisture; weight fraction	: 62 %	
Organic Matter; weight fraction	: 77 %	
Mass Density; as dry matter	: 149 kg/m3	1)
Shrinkage; relative volume decrease	: 21 %	1)
Pores; volume fraction	: 91 %	1)

At pressure height	-3cm	-10cm	–32cm	–50cm	–100cm
Water; volume fraction	85 %	84 %	58 %	51 %	44 %
Air; volume fraction	6 %	7 %	33 %	40 %	47 %
Amount of water from organic matter; weight ratio 2)	7.4	7.3	5.1	4.4	3.8

1) After moistening at a pressure height of –3 cm
2) Expressed in gram water per gram organic matter

CONCLUSION
Herewith the analysed results.
For questions regarding this research please contact the customer services.
Details of the analysed procedures can be sent to you free of charge.

Appendix 18 Physical analysis on the potting soil research with FYTOCELL, 1999

06-08-1999

Order Number:	920.073	2670801
Research Number:	920.074	Research Station for Nursery Stock P.O. Box 118 2770 AC Boskoop

Copy sent to: BLGG Discount agreement, P.O. Box 115, 6860 AC Oosterbeek
Customer Reference: PROJECT 1333

SAMPLE DATA

Object Code:		Research Code:	920 physical
Date of Sampling:	15-07-1999	Sample Indication:	B FYTO 2
Date Received:	16-07-1999	Sampling done by:	not by BLGG

RESULTS OF ANALYSIS

Moisture; weight fraction	: 62 %	
Organic Matter; weight fraction	: 78 %	
Mass Density; as dry matter	: 135 kg/m3	1)
Shrinkage; relative volume decrease	: 21 %	1)
Pores; volume fraction	: 92 %	1)

At pressure height	-3cm	-10cm	–32cm	–50cm	–100cm
Water; volume fraction	82 %	80 %	55 %	49 %	42 %
Air; volume fraction	10 %	12 %	37 %	43 %	50 %
Amount of water from organic matter; weight ratio 2)	7.8	7.6	5.2	4.7	4.0

1) After moistening at a pressure height of –3 cm
2) Expressed in gram water per gram organic matter

CONCLUSION
Herewith the analysed results.
For questions regarding this research please contact the customer services.
Details of the analysed procedures can be sent to you free of charge.

Appendix 19 Physical analysis of the potting soil research with FYTOCELL, 1999

06-08-1999

Order Number: 920.073
Research Number: 920.075

2670801
Research Station for
Nursery Stock
P.O. Box 118
2770 AC Boskoop

Copy sent to: BLGG Discount agreement, P.O. Box 115, 6860 AC Oosterbeek
Customer Reference: PROJECT 1333

SAMPLE DATA

Object Code:		Research Code:	920 physical
Date of Sampling:	15-07-1999	Sample Indication:	C FYTO 3
Date Received:	16-07-1999	Sampling done by:	not by BLGG

RESULTS OF ANALYSIS

Moisture; weight fraction	: 62 %	
Organic Matter; weight fraction	: 78 %	
Mass Density; as dry matter	: 135 kg/m3	1)
Shrinkage; relative volume decrease	: 23 %	1)
Pores; volume fraction	: 92 %	1)

At pressure height	-3cm	-10cm	–32cm	–50cm	–100cm
Water; volume fraction	81 %	79 %	54 %	48 %	41 %
Air; volume fraction	11 %	13 %	38 %	44 %	51 %
Amount of water from organic matter; weight ratio 2)	7.7	7.5	5.1	4.6	3.9

1) After moistening at a pressure height of –3 cm
2) Expressed in gram water per gram organic matter

CONCLUSION
Herewith the analysed results.
For questions regarding this research please contact the customer services.
Details of the analysed procedures can be sent to you free of charge.

Appendix 20 Physical analysis of the potting soil research with FYTOCELL, 1999

06-08-1999

Order Number:	920.073	2670801
Research Number:	920.076	Research Station for Nursery Stock P.O. Box 118 2770 AC Boskoop

Copy sent to: BLGG Discount agreement, P.O. Box 115, 6860 AC Oosterbeek
Customer Reference: PROJECT 1333

SAMPLE DATA

Object Code:		Research Code:	920 physical
Date of Sampling:	15-07-1999	Sample Indication:	D FYTO 4
Date Received:	16-07-1999	Sampling done by:	not by BLGG

RESULTS OF ANALYSIS

Moisture; weight fraction					: 64 %	
Organic Matter; weight fraction					: 74 %	
Mass Density; as dry matter					: 124 kg/m3	1)
Shrinkage; relative volume decrease					: 21 %	1)
Pores; volume fraction					: 93 %	1)
At pressure height	-3cm	-10cm	–32cm	–50cm	–100cm	
Water; volume fraction	80 %	78 %	54 %	47 %	42 %	
Air; volume fraction	13 %	15 %	39 %	46 %	51 %	
Amount of water from organic matter; weight ratio 2)	8.7	8.5	5.9	5.1	4.6	

1) After moistening at a pressure height of –3 cm
2) Expressed in gram water per gram organic matter

CONCLUSION

Herewith the analysed results.
For questions regarding this research please contact the customer services.
Details of the analysed procedures can be sent to you free of charge.

Appendix 21 Physical analysis of the potting soil research with FYTOCELL, 1999

25-05-1999

Order Number: 920.053 2670801
Research Number: 920.055 Research Station for Nursery Stock
P.O. Box 118
2770 AC Boskoop

Copy sent to: BLGG Discount agreement, P.O. Box 115, 6860 AC Oosterbeek
Customer Reference: 5007

SAMPLE DATA

Object Code:		Research Code:	920 physical
Date of Sampling:	28-04-99	Sample Indication:	5007 ST Potting soil 100%
Date Received:	29-04-99	Sampling done by:	not by BLGG

RESULTS OF ANALYSIS

Moisture; weight fraction	: 70 %	
Organic Matter; weight fraction	: 74 %	
Mass Density; as dry matter	: 131 kg/m3	1)
Shrinkage; relative volume decrease	: 24 %	1)
Pores; volume fraction	: 92 %	1)

At pressure height	-3cm	-10cm	–32cm	–50cm	–100cm
Water; volume fraction	85 %	83 %	58 %	50 %	44 %
Air; volume fraction	7 %	9%	34 %	42 %	48 %
Amount of water from organic matter; weight ratio 2)	8.8	8.6	6.0	5.2	4.5

1) After moistening at a pressure height of –3 cm
2) Expressed in gram water per gram organic matter

CONCLUSION
Herewith the analysed results.
For questions regarding this research please contact the customer services.
Details of the analysed procedures can be sent to you free of charge.

Appendix 22 Physical analysis of the potting soil research with FYTOCELL, 1999

25-05-1999

Order Number:	920.053	2670801
Research Number:	920.054	Research Station for Nursery Stock P.O. Box 118 2770 AC Boskoop

Copy sent to: BLGG Discount agreement, P.O. Box 115, 6860 AC Oosterbeek
Customer Reference: 5007

SAMPLE DATA

Object Code:		Research Code:	920 physical
Date of Sampling:	28-04-99	Sample Indication:	Fytocell 20 vol%
Date Received:	29-04-99	Sampling done by:	not by BLGG

RESULTS OF ANALYSIS

Moisture; weight fraction					: 70 %	
Organic Matter; weight fraction					: 76 %	
Mass Density; as dry matter					: 120 kg/m3	1)
Shrinkage; relative volume decrease					: 25 %	1)
Pores; volume fraction					: 93 %	1)
At pressure height	-3cm	-10cm	–32cm	–50cm	–100cm	
Water; volume fraction	80 %	79 %	56 %	48 %	42 %	
Air; volume fraction	13 %	14 %	37 %	45 %	51 %	
Amount of water from organic matter; weight ratio 2)	8.8	8.7	6.1	5.3	4.6	

3) After moistening at a pressure height of –3 cm
4) Expressed in gram water per gram organic matter

CONCLUSION
Herewith the analysed results.
For questions regarding this research please contact the customer services.
Details of the analysed procedures can be sent to you free of charge.

Appendix 23 Chemical analysis of the potting soil with Fytocell - Research Station, Boskoop, 1999

B1. Results from the research - Improving the quality of the potting soil - beginning Week 28, 1999

Treatment	EC mS/cm	pH	NH4 mmol/l	K mmol/l	Na mmol/l	Ca mmol/l	Mg mmol/l	NO3 mmol/l	Cl mmol/l	SO4 mmol/l	HCO3 mmol/l	P mmol/l	Trace elements - micromol/l extract 1:2 volume Fe	Mn	Zn	B	Cu	Mo
week 28																		
1.Control		0,7	4,7	1,5	1,3	1	0,6	0,6	3,6	0,4	0,6	0,1	0,55	13	2,2	0,5	4,6	0,6	0,1
2.10% vol.Fytocell		0,9	4,6	1,7	1,5	1	1	1,1	5	0,4	0,6	0,1	1,99	14	4,4	0,8	5,1	0,5	0,1
3.20% vol.Fytocell		1,2	4,5	2,3	1,9	1	1,8	1,8	7,2	0,5	0,9	0,1	3,77	18	7	1,3	6,8	0,8	0,1
4.30% vol.Fytocell		1,5	4,8	2,7	2,3	1,2	2,4	2,2	8,8	0,6	1,1	0,1	4,8	21	9,2	1,4	7,9	0,8	0,1

B1. Results from the research - Improving the quality of the potting soil - Week 37, 1999

week 37 Crop: Buddleja																		
1.Control		0,2	4,8	0,1	0,5	1	0,1	0,2	0,3	0,4	0,5	0,1	0,09	1,6	1	0,1	2,8	0,4	0,2
2.10% vol.Fytocell		0,2	5	0,1	0,4	0,8	0,1	0,1	0,1	0,3	0,6	0,1	0,06	1,9	0,8	0,1	2,5	0,3	0,3
3.20% vol.Fytocell		0,2	4,9	0,1	0,5	0,2	0,3	0,2	0,3	0,3	0,6	0,1	0,17	2,1	1,6	0,3	2,7	0,5	0,2
4.30% vol.Fytocell		0,2	5,1	0,1	0,4	0,8	0,2	0,1	0,2	0,3	0,6	0,1	0,12	1,5	0,4	0,6	2,1	0,2	0,1
week 37 repeat												1						
1.Control		0,2	4,9	0,1	0,4	0,8	0,1	0,1	0,2	0,3	0,7	0,1	0,06	2,2	0,2	0,1	3,2	0,4	0,1
2.10% vol.Fytocell		0,2	5	0,1	0,4	0,9	0,1	0,1	0,1	0,3	0,6	0,1	0,06	1,7	0,3	0,1	2,9	0,2	0,1
3.20% vol.Fytocell		0,1	4,9	0,1	0,3	0,7	0,1	0,1	0,1	0,3	0,7	0,1	0,08	1,6	0,3	0,1	3,1	0,3	0,1
4.30% vol.Fytocell		0,2	5,3	0,1	0,4	0,8	0,2	0,1	0,3	0,2	0,6	0,1	0,17	2,5	1,6	0,5	2,4	0,5	0,3

B2. Usage of Fytocell in the potting soil, week 27, 1999

week 27 Crop: Chamaecyparis nootkatensis																		
Lava floor, - Fytocell		1,2	4,3	2,3	2,8	0,8	0,9	1,3	7,1	0,6	0,8	0,1	1,46	12	2,9	1,2	11	0,7	0,1
Lava floor, + Fytocell		1,3	4,5	3,1	3,2	1	1	1,2	6,7	0,4	1,2	0,1	1,86	14	2,9	2,1	13	1	0,1
Concrete , - Fytocell		0,8	4,5	1,3	1,8	1	0,6	0,7	4,2	0,4	0,6	0,1	0,88	16	3,1	1,1	13	0,9	0,1
Concrete,+ Fytocell		0,8	4,6	1,6	2	1	0,7	0,7	4,3	0,4	0,6	0,1	0,94	9,8	2	1	11	1	0,1

Analysis of the used water (recirculation water) in week 31, 1999

week 31 Si																		
Recirculation water	0,17	0,6	7,5	0,1	0,4	1,4	1,5	0,4	0,3	1,3	0,4	2,3	0,12	0,6	0,9	0,7	2,8	0,2	0,1

Appendix 24

Research on Fytocell as soil improving material

Project 1333 Length in cm 17 Nov.1999

Crop Buddleja

Treatment		plant 1	2	3	4	5	6	7	8	9	10			
1A-white		52	47	58	43	53	62	47	60	62	45	529	52,9	
1B white		54	58	64	63	65	66	58	55	54	47	584	58,4	
1C white		55	44	50	50	54	40	50	40	43	47	473	47,3	
1D white		50	65	52	54	58	55	65	57	60	60	576	57,6	54,5
												0	0	
2A yellow		53	39	56	57	63	46	47	55	69	42	527	52,7	
2B yellow		56	67	40	60	53	60	67	60	66	63	592	59,2	
2C yellow		52	50	55	56	57	46	53	55	46	48	518	51,8	
2D yellow		53	56	56	60	64	60	56	55	60	50	570	57	55,18
												0	0	
3A green		46	47	50	52	60	58	53	48	52	54	520	52	
3B green		63	53	56	52	54	57	64	48	54	63	564	56,4	
3C green		56	55	62	54	53	56	50	52	53	62	553	55,3	
3D green		66	56	48	60	50	47	45	60	42	50	524	52,4	54,03
												0	0	
4A red		55	46	50	56	57	56	57	50	52	60	539	53,9	
4B red		60	55	56	50	62	63	56	55	43	57	557	55,7	
4C red		54	55	57	58	57	64	58	53	56	46	558	55,8	
4D red		62	60	60	60	54	53	57	52	50	57	565	56,5	55,48

Appendix 25

Research on Fytocell as soil improving material in potting soil

Project 1333 Number of branches per plant

Crop Buddleja 17 Nov. 1999

Treatment		plant no1	2	3	4	5	6	7	8	9	10			
1A-white		3	4	2	7	4	3	4	5	3	3	38	3,8	
1B white		4	5	7	4	6	4	3	5	4	4	46	4,6	
1C white		2	2	3	3	4	3	4	4	4	2	31	3,1	
1D white		5	3	5	4	4	6	3	4	5	4	43	4,3	3,95
												0	0	
2A yellow		4	3	4	4	5	5	5	7	2	5	44	4,4	
2B yellow		5	2	4	4	3	6	3	4	4	3	38	3,8	
2C yellow		4	5	4	5	4	6	4	4	5	3	44	4,4	
2D yellow		4	6	7	4	4	2	6	3	5	4	45	4,5	4,28
												0	0	
3A green		6	4	5	4	5	4	4	4	6	4	46	4,6	
3B green		6	5	5	3	4	3	4	4	3	4	41	4,1	
3C green		5	3	3	2	5	5	4	5	5	5	42	4,2	
3D green		3	4	4	5	3	5	5	4	5	6	44	4,4	4,33
												0	0	
4A red		4	6	7	3	6	4	5	7	4	5	51	5,1	
4B red		4	7	7	6	5	5	6	5	4	3	52	5,2	
4C red		6	5	4	5	4	4	4	4	4	3	43	4,3	
4D red		3	4	5	5	4	3	5	5	4	4	42	4,2	4,7

Appendix 26

Research on Fytocell as soil improving material in potting soil

Project 1333 Fresh weight in grams 17 Nov. 1999

Crop Buddleja

Treatment		plant no1	2	3	4	5	6	7	8	9	10			
1A-white		62,5	47	32	92,4	62,7	88,7	60,3	88,7	98,6	45,8	678,7	67,87	
1B white		86,2	68,4	129,2	77,3	118,6	103	58,9	77,5	63	43,9	826	82,6	
1C white		41,7	38,3	54,7	54,3	74,8	52,3	66,2	62,4	64,9	46,2	555,8	55,58	
1D white		74,8	81,8	84,9	58,6	70,7	97,8	69,4	56,1	71	64,1	729,2	72,92	69,7
												0	0	
2A yellow		63,3	44,8	66,6	66,2	95,3	42,2	47,2	105,6	60,5	37,3	629	62,9	
2B yellow		73,8	73,8	37,8	46,6	46,3	11,2	90,3	56,8	88,5	93,7	618,8	61,88	
2C yellow		49,7	90	60,9	64,3	50,4	53,1	60,8	63	81	44,7	617,9	61,79	
2D yellow		44,5	71,2	77,7	87,5	79,9	62,3	87,5	52,8	79,6	71,4	714,4	71,44	64,5
												0	0	
3A green		56,9	60,5	50,6	58,1	79	76,9	64,8	59,5	72,2	73,2	651,7	65,17	
3B green		107,8	55,9	74,6	68,1	64,7	50,5	68,4	40,8	64,5	82,2	677,5	67,75	
3C green		106,3	57,2	76,9	54,2	67,7	80,5	48,6	58,8	81,6	93,2	725	72,5	
3D green		62,8	72,9	57,9	114,3	55,6	48,6	51,3	91,7	46,5	78,5	680,1	68,01	68,4
												0	0	
4A red		52,9	74,4	96,4	70,5	70,8	93,8	78,1	74,8	57,3	64	733	73,3	
4B red		79,5	62,5	95,2	75,9	77,4	89,5	83,4	61,1	57,7	52,4	734,6	73,46	
4C red		57,6	70,6	52,8	77,7	77,9	100,2	62,4	62,1	53,9	35,4	650,6	65,06	
4D red		67,1	67,1	66,6	69,8	62,7	60,5	77,6	82	52,5	65,8	671,7	67,17	69,8

Appendix 27

Research on Fytocell as soil improving material in potting soil

Project 1333 Dry weight in gram 17 Nov.1999

Crop Buddleja

Treatment		plant no1	2	3	4	5	6	7	8	9	10		
1A-white													
1B white													
1C white													
1D white		33,1	37,2	36,4	23,7	30,2	43,7	30,6	25,1	31,2	26,8	318	31,8
2A yellow													
2B yellow													
2C yellow													
2D yellow		18	30,7	32,7	36,5	34,9	26,2	35,1	20,1	32,3	29,5	296	29,6
3A green													
3B green													
3C green													
3D green		26,9	32,4	23,1	51,4	23,5	20,3	22,7	41,5	18,5	32,4	292,7	29,3
4A red													
4B red													
4C red													
4D red		28,6	29	28,3	27,7	21,6	24,6	31,7	35,3	20,9	27,8	275,5	27,6

Appendix 28

Research on Fytocell as soil improving material in potting soil

Project 1333 Root Quality 1(extremely bad) - 5(extremely good)

Crop Buddleja 17 Nov. 1999

Treatment		plant no1	2	3	4	5	6	7	8	9	10			
1A-white		4	3	3	4	4	4	3	4	4	3	36	3,6	
1B white		4	4	5	4	4	4	3	4	4	3	39	3,9	
1C white		3	4	4	3	4	3	4	3	4	3	35	3,5	
1D white		4	4	4	3	4	4	3	4	4	4	38	3,8	3,7
												0	0	
2A yellow		4	4	4	5	5	4	4	5	4	4	43	4,3	
2B yellow		4	5	4	4	4	5	5	4	4	4	43	4,3	
2C yellow		4	4	5	4	5	5	4	4	4	4	43	4,3	
2D yellow		4	4	5	4	4	5	4	4	5	4	43	4,3	4,3
												0	0	
3A green		5	4	4	4	4	4	4	5	4	5	43	4,3	
3B green		5	4	5	4	5	4	4	4	4	5	44	4,4	
3C green		5	4	5	4	4	4	5	5	4	5	45	4,5	
3D green		4	4	4	5	4	5	4	5	4	5	44	4,4	4,4
												0	0	
4A red		5	4	5	4	4	4	5	5	4	4	44	4,4	
4B red		5	5	4	4	5	5	4	4	4	4	44	4,4	
4C red		4	5	4	4	5	4	4	4	5	4	43	4,3	
4D red		4	4	4	5	4	4	4	5	4	4	42	4,2	4,3

Standards for Root Quality: 1 (extremely bad) - 5 (extremely good)

1 - extremely bad = < 20% of the outside of the pot covered with healthy active roots

2 - bad = 20 - 40 % of the outside of the pot covered with healthy active roots

3 - average = 40 - 60 % of the outside of the pot covered with healthy active roots

4 - good = 60 - 80 % of the outside of the pot covered with healthy active roots

5 - extremely good = > 80 % of the outside of the pot covered with healthy active roots

Appendix 29

Research on Fytocell as soil improving material in potting soil

Project 1333 Length in cm 17 Nov. 1999

Crop: Chamaecyparis nootkatensis 'Glauca' Chaemacyparis nootkatensis 'Aurea'

Treatment	LavaFloor without	LavaFloor with	Concrete without	Concrete with	LavaFloor without	LavaFloor with	Concrete without	Concrete with
plant no.	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell
1	69	46	65	69	54	61	60	55
2	69	59	57	57	58	60	53	57
3	66	69	54	63	60	57	54	57
4	71	66	63	62	48	56	50	52
5	64	67	57	62	48	56	53	58
6	68	68	67	66	56	63	53	54
7	66	63	61	65	58	60	47	54
8	63	62	70	56	60	52	52	51
9	67	61	65	64	50	53	53	58
10	73	71	51	57	54	50	53	50
11	62	75	68	67	51	58	53	54
12	60	70	61	73	59	61	56	54
13	65	67	65	72	59	57	50	54
14	66	67	65	61	54	56	58	57
15	66	72	66	72	55	58	55	56
16	69	73	67	68	55	59	46	56
17	70	75	69	60	47	56	57	59
18	65	70	62	70	57	52	53	53
19	63	63	67	69	60	56	50	60
20	67	60	61	68	67	57	51	59
21	69	68	61	66	56	57	50	56
22	60	69	66	65	53	52	56	60
23	67	68	71	67	60	53	56	62
24	53	76	63	56	52	58	50	53
Total	1578	1605	1522	1555	1331	1358	1269	1339
Average	65,8 cm	66,9 cm	63,4 cm	64,8 cm	55,5 cm	56,6 cm	52,9 cm	55,8 cm

Appendix 30

Research on Fytocell as soil improving material in potting soil

Project 1333 Dry weight in grams 17 Nov. 1999

Crop: Chamaecyparis nootkatensis 'Glauca' Chaemacyparis nootkatensis 'Aurea'

Treatment	LavaFloor without	LavaFloor with	Concrete without	Concrete with	LavaFloor without	LavaFloor with	Concrete without	Concrete with
plant no.	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell
1	297,2	185,9	213,2	167,4	203,1	276,5	210,8	245
2	241	249,7	225,5	176,4	235	294	156,5	234,4
3	282,4	237,6	211,7	249	298,2	213	214,4	264,4
4	300,1	317	262,8	243	188,5	204	218,3	281,4
5	173,8	249,6	261,4	239,6	193,8	210,8	200,5	269,8
6	380,5	247,4	285,4	233	215,7	231,1	199,6	290,1
7	323,6	213,1	241,8	278,2	261,6	315,7	235	283,7
8	309,7	234,2	230,2	287,6	325,8	153,4	157,4	225,1
9	238,8	268,8	278	227,3	245	167,9	234,1	269,5
10	272	327,6	190,5	148,7	204,3	187,6	244,2	286,6
11	205,1	397,6	198,7	342,6	213,4	251	207,5	246,5
12	192,7	279,1	207,4	242,9	151,5	327,3	255	215,9
13	242,3	438,9	309,6	201	253,6	148,1	233,5	217
14	235,2	211,1	222,8	353,6	238,8	190,6	205,2	210,5
15	214,8	393,3	233,9	293,2	180,5	217,3	234,7	250
16	419,8	269,4	262,1	229,7	212,1	264,7	187,9	291,4
17	393	329,2	236,3	269,5	240,3	168,8	194,8	240,7
18	322,7	289,6	232,3	139,8	180,1	181,2	296,1	256,7
19	255,3	307,8	286,8	233,6	292,3	234,2	275,6	306,5
20	284,2	245,6	279,2	401,3	192,1	138,9	249	312,4
21	402,9	248,8	272,1	272,5	285,1	243,3	198,9	215,1
22	388,9	263	283,7	334,6	215,7	190	247,6	271,5
23	247,1	299	264,9	340	379,2	292,2	300,9	282,8
24	274,5	305	262	217,7	227,7	281,7	225	215,1
Total	6897,6	6808,3	5952,3	6122,2	5633,4	5383,3	5382,5	6182,1
Average	287,4	283,7	248,0	255,1	234,7	224,3	224,3	257,6

Weight % dry matter between 36-37% of the fresh weight

Appendix 31

Research on Fytocell as soil improving material in potting soil

Project 1333 Root Quality 17 Nov.1999

Crop: Chamaecyparis nootkatensis 'Glauca' Chaemacyparis nootkatensis 'Aurea'

Treatment	LavaFloor without	LavaFloor with	Concrete without	Concrete with	LavaFloor without	LavaFloor with	Concrete without	Concrete with
plant no.	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell	Fytocell
1	4	5	3	3	3	4	2	3
2	4	4	2	2	3	5	2	3
3	4	4	3	3	4	3	2	3
4	3	5	3	3	4	4	2	3
5	4	5	3	2	3	4	2	3
6	4	5	3	3	3	4	2	3
7	4	5	4	3	3	4	3	3
8	4	5	3	3	3	4	2	3
9	4	4	3	4	3	4	2	4
10	4	5	3	2	3	4	3	2
11	3	5	4	3	3	3	2	3
12	4	5	3	3	3	4	2	4
13	3	4	3	3	3	4	2	2
14	4	4	3	3	3	3	2	3
15	4	4	3	3	3	4	3	4
16	3	4	3	3	3	3	2	4
17	4	5	3	3	3	3	3	3
18	4	4	3	3	3	4	2	2
19	4	3	3	3	3	4	2	3
20	5	4	3	2	4	3	2	2
21	4	4	3	3	3	4	2	3
22	3	3	3	3	4	3	2	4
23	4	4	2	3	4	3	2	3
24	3	4	3	3	3	4	2	3
Total	91,0	104,0	72,0	69,0	77,0	89,0	52,0	73,0
Average	3,8	4,3	3,0	2,9	3,2	3,7	2,2	3,0

Standard for Root Quality: 1 (extremely bad) - 5 (extremely good)

1- Extremely bad = < 20% of the outside of the pot covered with healthy active roots

2 - bad = 20 - 40% of the outside of the pot covered with healthy active roots

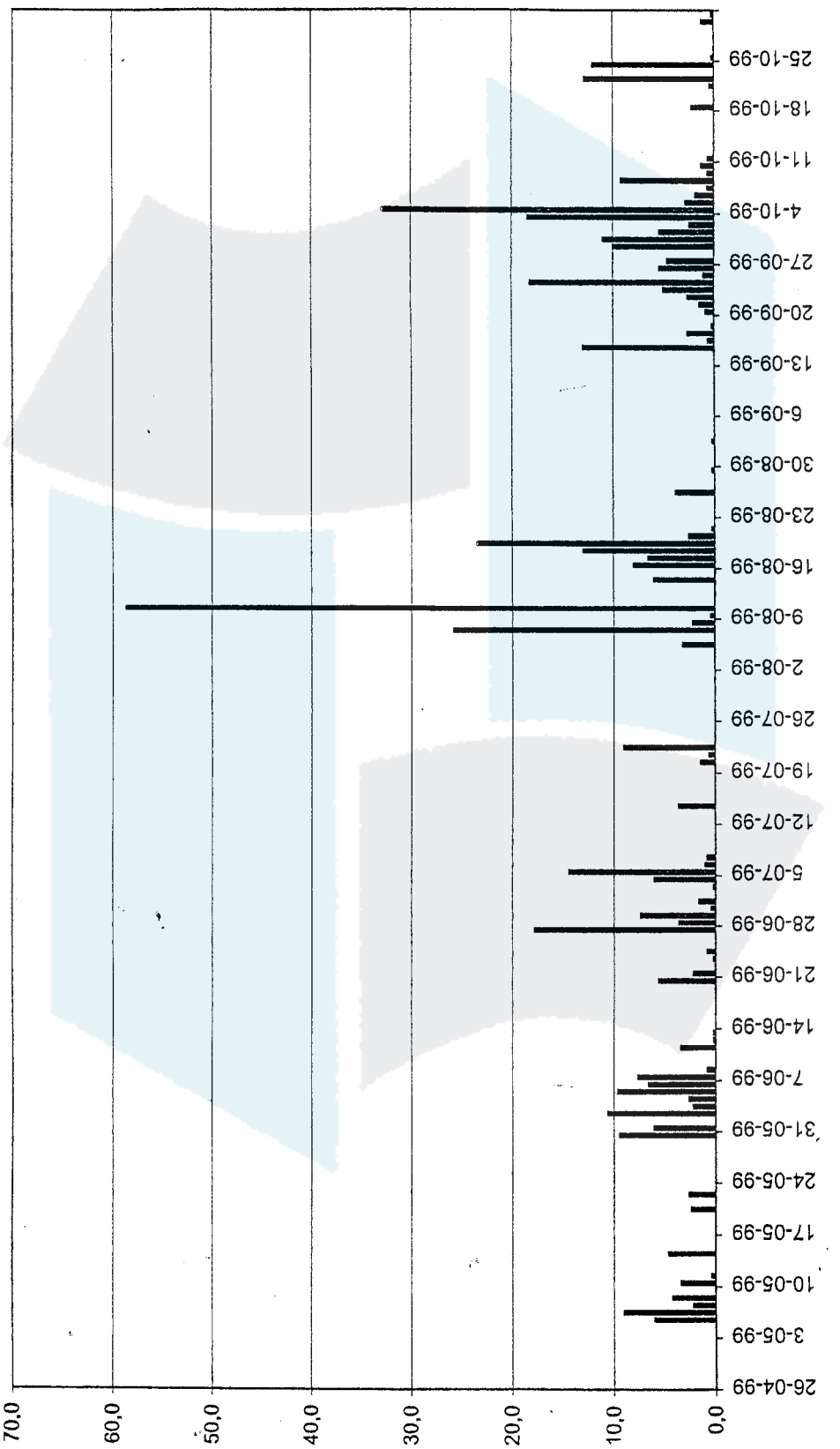
3 - average = 40 - 60 % of the outside of the pot covered with healthy active roots

4 - good = 60 - 80 % of the outside of the pot covered with healthy active roots

5 - extremely good = > 80 % of the outside of the pot covered with healthy active roots

Appendix 32 The rainfall (deposit) during the growing season in Boskoop, 1999

x-axis Amount of rainfall per day y-axis Rainfall in mm



Appendix 33

Map of research field with plant hole at Research Station, Zundert 1999

Project: 1333

Research on the usage of FYTOCELL as a soil improving material

East

A 3 0 % Control		.C 3 30% Fytocell		B 3 15% Fytocell
B 2 15% Fytocell		A 2 0 % Control		C 2 30% Fytocell
C 1 30% Fytocell		B 1 15% Fytocell		A 1 0 % control

West Path