From Forest Nursery Notes, Summer 2008

141. Classification of growing media on their environmental profile. Verhagen, J. B. G. M. and Boon, H. T. M. Acta Horticulturae 779:231-239. 2008.

Classification of Growing Media on Their Environmental Profile

J.B.G.M. Verhagen and H.T.M. Boon
Foundation RHP
Naaldwijk
The Netherlands

Keywords: growing media, environmental classification, life cycle analysis

Abstract

RHP is currently developing a classification system that expresses the environmental quality of growing media. The system intends to offer producers and (professional) users transparency about the environmental quality of a particular substrate. Depending on their environmental profile, growing media are awarded an A, B or C classification. This classification is based on clear and public criteria. The criteria applied are partly quantitative, partly qualitative. The quantitative criteria are based on LCA's (lifecycle analyses), which have been made for all major raw materials and additives. The qualitative criteria address aspects that are hard to quantify, but are nevertheless environmentally relevant, such as the level of environment management in the various stages in the production chain (including end-of-life).

INTRODUCTION

In the last years, more and more user groups demand attention for the environmental impact of production of raw materials for growing media. In the United Kingdom, this resulted in a strong wish to minimize the use of peat, to be followed by 'peat-free' growing media and soil improvers. It is questionable whether these actions are based on emotion or ratio. No-one really knows if alternatives are environmentally better than peat. Besides this professional horticulture, as well as consumers, demand certain quality of the products they use. Using inferior growing media can cause failure of crops thus in fact creating useless use of resources which were put in the crop so far. For all parties involved it is of major importance that a transparent system of comparison and weighing of growing media is created. Such system should be straight forward and relatively simple to make broad implementation in the industry possible. With this background RHP has developed a system which can weigh growing media on their environmental impact.

BASIC APPROACH

The classification system expresses the environmental quality of RHP-certificated products. All relevant environmental aspects, during the entire lifecycle of the products, are taken into account. The classification system offers producers and (professional) users transparency about the environmental quality of a particular substrate.

Categorising the substrate in a certain environmental-class is based on clear and public criteria. These criteria are partly quantitative, partly qualitative. The quantitative criteria are based on LCA's (lifecycle analysis) which have been made of all major raw materials and additives. The qualitative criteria stand for aspects which are difficult to quantify, but nevertheless are relevant environmental aspects; for instance quality of environment management in the various levels of the production chain.

The highest environmental classification expresses that the environmental score of the product is considerably better than the market average. Vice versa stands the lowest classification for a product which scores considerably lower than the average.

In line with the Dutch MPS-system (production of floral products), an A-B-C classification is proposed based on the total score (between 0 and 100). An "A"-classification follows with a score higher than 70 points. A "C"-classification stands for a score lower than 30 points. The MPS-system is well known by professional growers in The Netherlands (and therefore buyers of growing media).

WEIGHING SCORES

From the environmental analyses, four environmental aspects showed up to be determining for the environmental profile of substrates.

Measures during Production

Measures taken in order to minimise the environmental impact during production / extraction of raw materials (planning, management, after-use) are relevant for all raw materials which are not being produced from waste material. The system is using existing guidelines. For mining products like perlite, the guidelines of the European mining industry (anonimus, 1999) are used, for wood the certification systems of the global FSC (Forest Stewardship Council), or the PEFC (Pan European Forestry Council). For the most important raw material of this moment, peat, the guidelines derived from in WUMP (Wise Use of Mires and Peatlands) (Joosten and Clarke, 2002) which are currently being set up will be implemented.

Lyfe Cycle Analysis (LCA) Scores

For the following materials LCA's are now available (in alphabetical order): (composted) bark, coco (dust, coir, chips, blocks), composted organic matter (green waste, household biowaste), expanded clay granules, various types of peat, perlite, vermiculite, pumice, rice hulls, mineral wool, wood fiber, various additives such as sand, clay and fertilizers.

The data are structured in such a way that the environmental profile of single materials as well as product mixes can be assessed. The LCA's have been performed and documented in conformity with SETAC principles (SETAC; The Society of Environmental Toxicology and Chemistry; an international scientific network leading in standardising LCA-practices), meaning that objectives, functional units, system boundaries, sources, assumptions and sensitivity analyses have been defined and administrated in a standard manner. At present, all LCA's are based on production and application in North Western Europe (including, of course, transport of raw materials to the production location). In order to put things into a European perspective, transport distances and modalities should be transformed to a sort of European average. Due to the structure of the database, this operation could be executed easily.

Setting up of the system boundaries is in this of main importance. For primary products as peat the system starts when opening a peat bog. For waste products like coir pith the system starts at the coir pith dump of the coir fiber mill. The foregoing traject is not taken into account due to the fact that coir pith produced as a primary product (Figs. 1 and 2).

The LCA's show distinct differences in the environmental profiles of the various materials. Some outcomes are shown in Figs. 3 to 6. In Figs. 3 and 4, it becomes clear that for peat the main aspects are the "greenhouse-effect" due to oxidation of carbon chains, and the use of energy, mainly during transport. For a waste product like coir pith (Fig. 6) oxidation of carbon is not taken into account, because it would have oxidized anyway. The main environmental impact for coir pith is created by transport. Especially transport by sea-vessels is creating high pollution, which reflects in the LCA.

When knowing the LCA outcomes of all the components of a growing medium, the LCA of a mixture can be set up too (Fig. 5).

Because it is impossible to weigh the several aspects in an LCA, the choice is made to use only the ones which can represent others and which do show main differences between raw materials used for growing media. From the LCA-scores on the environmental themes the two indicators 'greenhouse-effect' and 'human toxicants' have appeared to stand for the main points in the lifecycle analysis.

Some components like lime and fertilizers did show very low impact on the environmental score of a compounded medium (Fig. 5). In order to make the system easily applicable in industry these are not included in the classification.

Instead of creating exact LCA's for each separate source of material each type of

raw material is
figures for the
mixtures.

Only ma
differentiation w
is pulled up con
peat, frozen blac

Environmental

Environn
account. Althoug
number of bonus

Recycling of Gr

When po
media used for v
take back and re
number of malus

SCORES AND

Scores

The maxi
Table 1. The scor
- Essential are
LCA, raw m
profile of the
'greenhouse e
45 points max
- By having im
15 bonus poin
- For 2 groups
are taken in c
substrates whi
provisions at
The importan
practice this m
guarantees car
of raw materia
- For mineral pr
(max 15 malus

Reference Produc

An A-clas
environmental pro
of a raw material
market average. T
product results in a
maximum score re
100 points - classi
worse environment
Below 30 points le

Classification

For the sake
has been develope

raw material is qualified once by a general LCA. This creates clear and easy to handle figures for the compounding industry which at the end must calculate the scores of mixtures.

Only main differences in transport distance or transportation type can create some differentiation within materials. B.e. for bark imported by truck from France another LCA is pulled up compared with bark imported by ship from Portugal. For materials like white peat, frozen black peat, perlite etc. one LCA will be set.

Environmental Care during Production of Growing Media

Environmental care by the substrate producing company is also taken into account. Although it is not regarded as essential, it does offer the possibility for a limited number of bonus points.

Recycling of Growing Media

When possible growing media should be recycled. This is possible for growing media used for vegetable or cut flower cropping. The company has to offer the service to take back and recycle used substrates. By offering this service, a company does avoid a number of malus points.

SCORES AND CLASSIFICATION

Scores

The maximum scores which can be achieved on the various themes are stated in Table 1. The scoring set-up has been developed as follows.

- Essential are the results of the LCA's. With the scores on the two elements from the LCA, raw materials can score a max of 100 points. Based on the environmental profile of the 'standard Dutch substrate' (market average) the environmental theme 'greenhouse effect' has some more impact than the 'human toxicants' (55 respectively 45 points maximum).
- By having implemented environmental care, the growing media company can gain 15 bonus points (with which the maximum score adds up to 115).
- For 2 groups of raw materials it is necessary to show that supplementary provisions are taken in order to prevent that malus points lead to a lower total score. For all substrates which are not being produced from waste material it has to be proven that provisions at raw material extraction / production are taken (max. 45 malus points). The importance of this is in the same order of magnitude as the LCA-scores. In practice this means that the highest classification can not be reached when not enough guarantees can be given with regard to an environment-saving production / extraction of raw materials.
- For mineral products with a 100% application a take-back solution has to be in place (max 15 malus points, comparable with the 15 bonus points for environmental care).

Reference Product

An A-classification expresses that the product has a considerable better environmental profile than the market average. The scores are the result of a comparison of a raw material or substrate with a standard reference product which represents the market average. The score-system has been set up in such a way that the reference product results in an average score (so 50 points of the 100 - classification B) and that the maximum score results by using the most favourable raw material (in this case rice hulls - 100 points - classification A). Intermediate values will be valued linear. Products with a worse environmental profile than the standard product result, of course, in a lower score. Below 30 points leads to a C-classification.

Classification

For the sake of a quick and clearly structured classification a calculation module has been developed. After input of the substrate-recipe and info regarding the bonus/

malus scores the module will directly show the (environmental) classification (Fig. 7). Combination with the existing RHP quality certification system makes that little effort is necessary to certify this environmental classification as an extra module for companies.

Implementation

In principle, all materials are evaluated once for the system. For each source the scores will be calculated once. After that compounding industry easily can calculate the scores of mixtures produced.

WORK IN PROGRESS

At the moment the exact criteria are being elaborated. The bonus/malus score will be compared against these criteria. Considerations and criteria are and will remain accessible for all stakeholders, as well within Foundation RHP and its members, as for other companies and organisations.

ACKNOWLEDGEMENTS

The project was partly financed by NOVEM (http:\\www.novem.nl\).

Literature Cited

Anonymous, 1999. Guidelines to Sustainable Management for the European Mining Industry. Euromines, Geneva, 1999.

Joosten, H. and Clarke, D. 2002. Wise Use of Mires and Peatlands - Backgrounds and Principles including a Framework for Decision-making. International Mire Conservation Group and International Peat Society.

Tables

Table 1. Maximum scores of the various raw materials on the five determining environmental aspects.

Raw materials	Planning, management after-use of raw materials prod. sites (malus)	LCA green-house	LCA humantox	Environmental care (bonus)	Take back and recycle (malus)
Peat, wood fiber	-45	55	45	15	0
Coir, bark, rice hulls, greencompost	0	55	45	15	0
Perlite, vermiculite, pumice, expanded clay granules	-45	55	45	15	-15

Figures

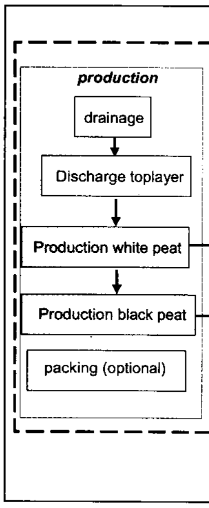


Fig. 1. System bou

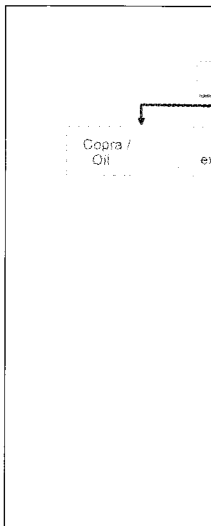


Fig. 2. System bou

l) classification (Fig. 7).
makes that little effort is
odule for companies.

em. For each source the
easily can calculate the

bonus/malus score will
a are and will remain
nd its members, as for

ovem.nl\).

the European Mining

ds - Backgrounds and
ational Mire Conserva-

e determining environ-

onmental (bonus)	Take back and recycle (malus)
15	0
15	0
15	-15

Figures

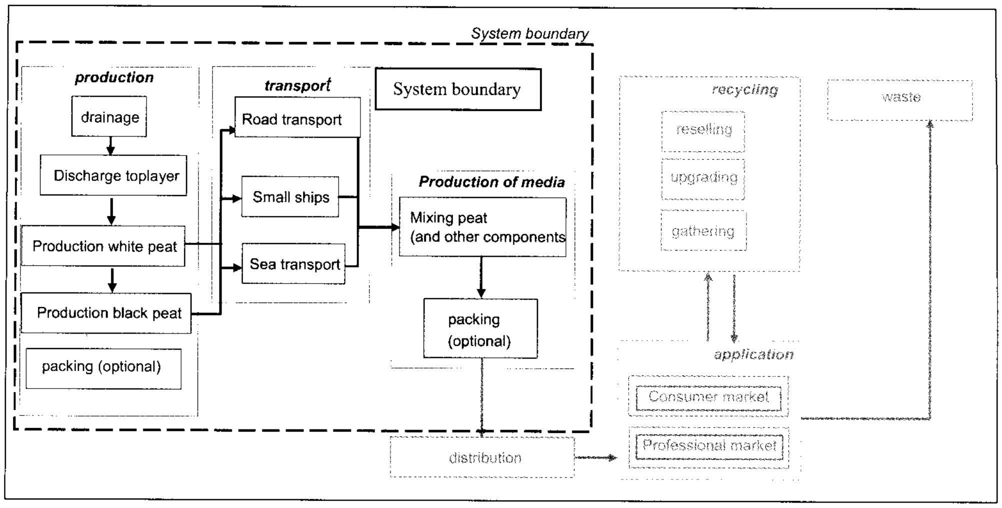


Fig. 1. System boundary for LCA of raw peat.

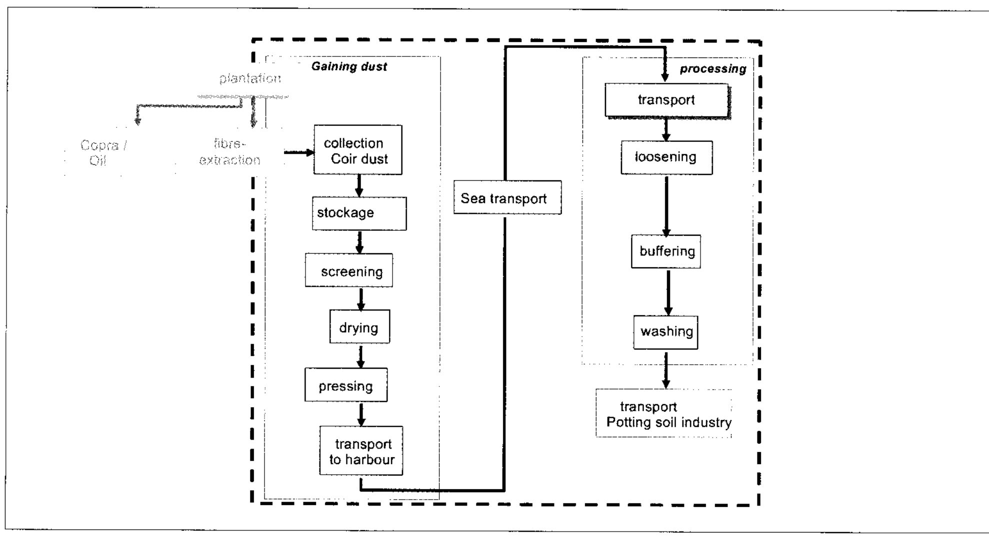


Fig. 2. System boundary for LCA of coir pith substrate.

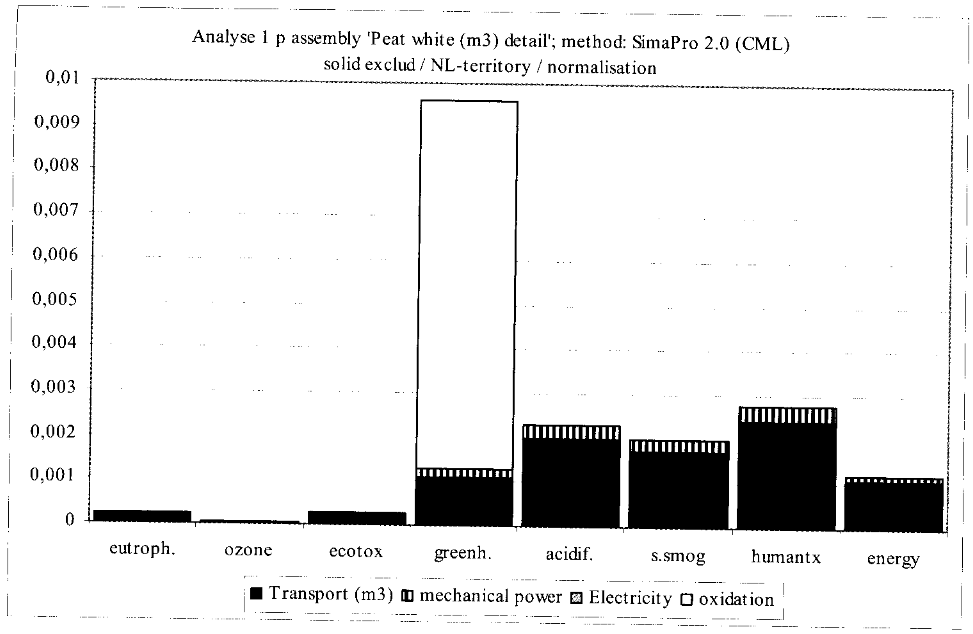


Fig. 3. Detailed set up of the environmental profile frozen black peat after production and transport to the end-user.

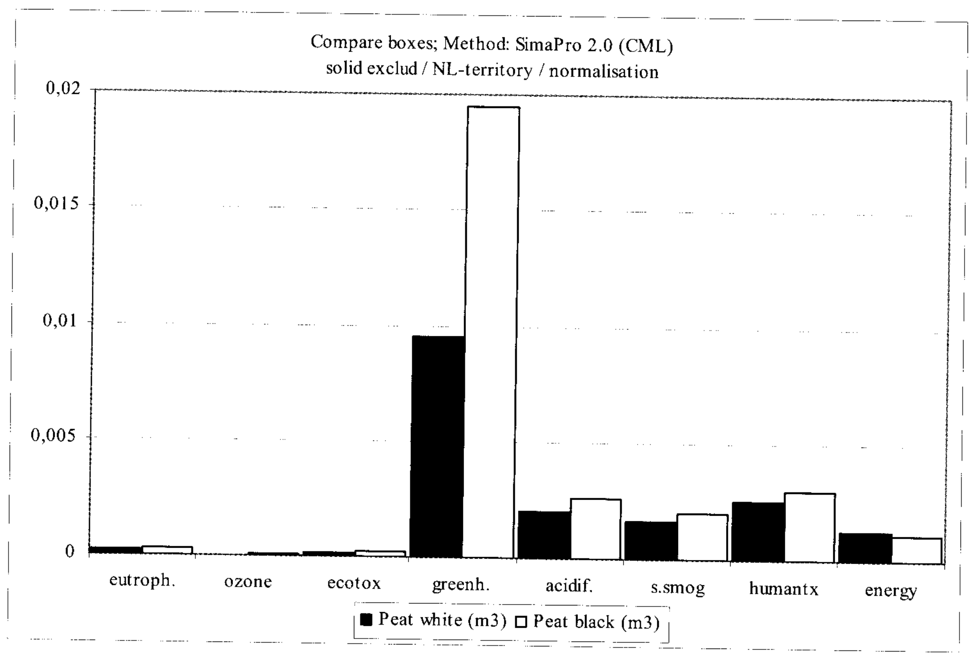


Fig. 4. Environmental profile of white peat and black peat after production and transport to the end-user.

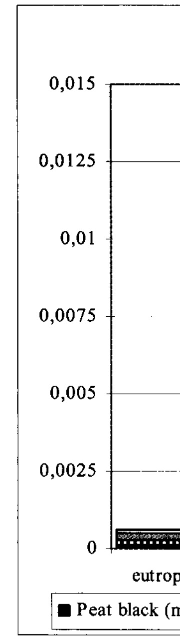


Fig. 5. Environm
frozen bl
LDPE fo

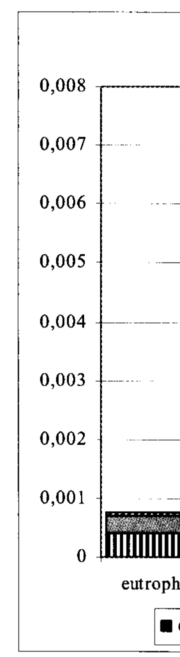
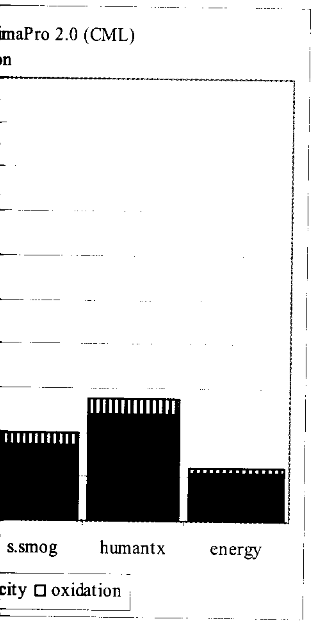
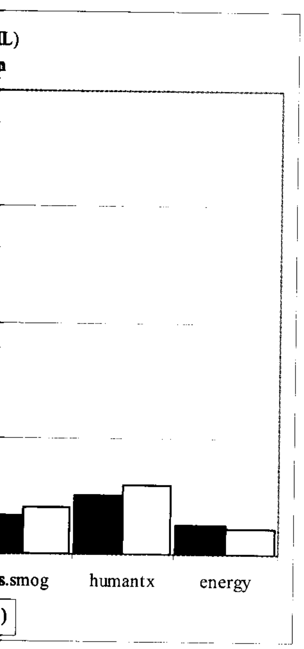


Fig. 6. Environm



black peat after production and



after production and transport

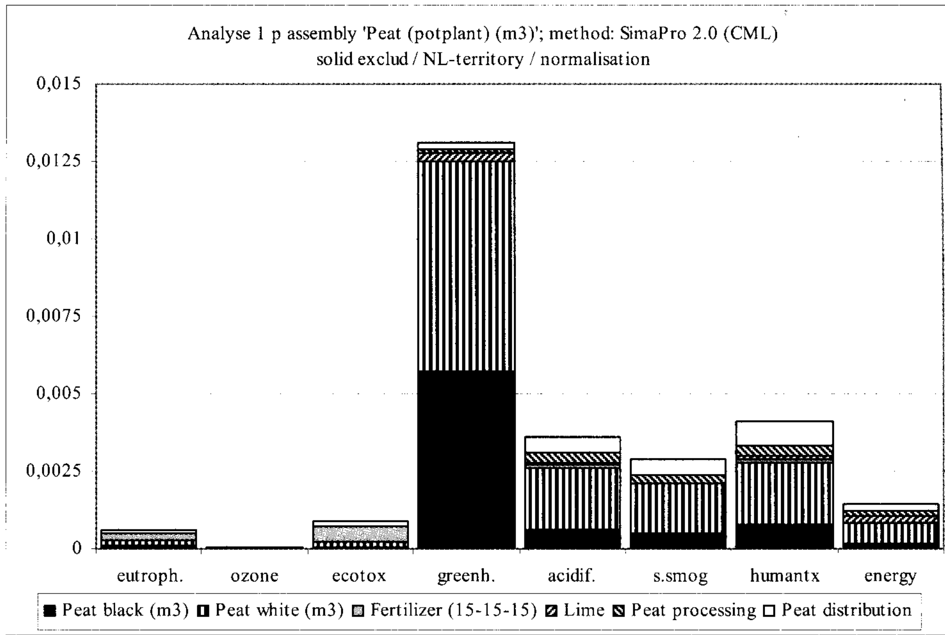


Fig. 5. Environmental profile of a peat-based growing medium; 30% white peat, 70% frozen black peat, NPK fertilizer 1,5 g.L^{-1}, lime 7 g.L^{-1}, sand 80 kg.m^{-3}, packed in LDPE foil 2 kg.m^{-3}.

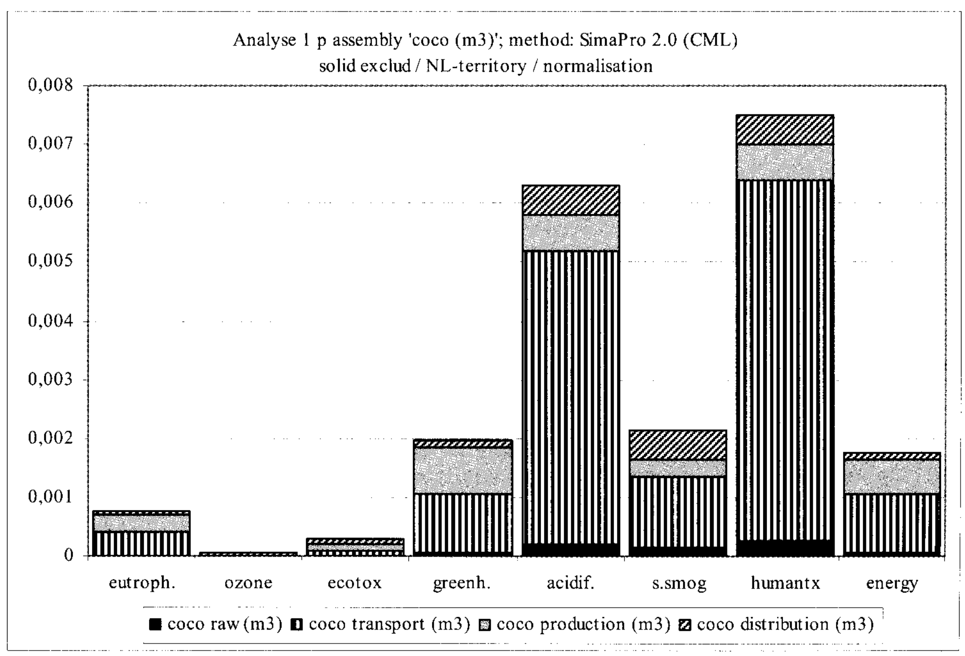


Fig. 6. Environmental profile of coir pith substrate.

Product composition		***mix***		
Peat white (m3)	***Env. Care***	0,40	B	
Peat black (m3)	***after use***	0,40	B	
Coir pith (m3)			B	
Exp. Clay granules (m3)			B	
Perlite (m3)			B	
Green waste-compost (m3)				A
Bark France (m3)		0,20		A
Bark Portugal (m3)				A
Woodfibre (m3)			B	
Pumice Iceland (m3)			B	
Pumice Germany (m3)			B	
Rice hulls (m3)				A
Other additions		p.m.		
Score raw components		***1,00***	***55***	
Environmental care and recycling			***score***	
Environmental care at production locations		yes	***15***	
Recycling		no		
Totalscore			***70***	
Classification			***A***	

Fig. 7. Example of the classification of a mixture, with "wise use of peat", environmental care and use of environmental friendlier components.

Experience w
Suitability of

C. Blok
Applied Plant R
Glasshouse Hort
P.O. Box 8, 267
The Netherlands

Keywords: bul
retention, rev

Abstract
The vari
media is large.
particles, synth
more or less sui
Selected
discuss the suit
bulk density, to
rewetting, hyd
measure these a
In concl
for growth sha
relate the form
other. It seems
wetting. Bulk d
on plant grow
resistance to r
Better definitio
and refreshme
oxygen transpo
because of the v

INTRODUCTI

The vari
media is large. F
synthetic foams
suitable as grow
The aim
growing media
parameters to b
anchorage, the
1995).
Anchora
differences in r
represented by *r*
always stable in
of water is relat
retention. The u
the roots. To a
consider some
hydrophobicity.
hydrophobicity r
a physical aspec

Proc. IS on Growing
Ed.: J.-C. Michel
Acta Hort. 779, ISHS