



## Experiences with web-based teaching in forestry

Olsen, C. S.; Treue, T.; Nielsen, Ø. J.; Hansen, J. N.; Flensmark, M.; Olsen, C. H.

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***Olsen C.S., Treue T., Nielsen Ø.J., Hansen J.N.,  
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**Author**

Olsen C.S., Treue T., Nielsen Ø.J., Hansen J.N., Flensmark M.  
& Olsen C.H.

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Danish Centre for Forest,  
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Hørsholm Kongevej 11  
DK-2970 Hørsholm  
Tel. 35 28 15 00  
E-mail [sl@kvl.dk](mailto:sl@kvl.dk)

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planning at the Royal  
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# Executive summary

The report details the general and specific outcomes of the pilot project on “Web-based teaching in tropical forestry” conducted at the Royal Veterinary and Agricultural University in the period summer 2002 to autumn 2003. The main objectives are to: (i) provide an overview of the structure and functioning of the developed and implemented e-learning courses; (ii) present an overview of the experiences gained; and (iii) synthesising knowledge gained into operational recommendations for use by university and department administrations as well as individual teachers interested in e-learning. As the report details the outcome of a pilot project, we have chosen to report in detail.

The two courses Tropical Forestry (6/12 ECTS) and Community Forestry (9 ECTS) were transformed from ordinary class-room courses to pure distance courses. Both courses are identically structured using the software Project Net and available through the Agricultural Development e-learning homepage ([www.flec.kvl.dk/ad](http://www.flec.kvl.dk/ad)). The courses are now available anywhere in the world where there is internet access. The courses are made up of around 600 web pages (including 430 pages of exercises). Each course contains a number of modules each covering a major course related topic. Each module is divided into Introduction, Overview (specifying purpose, subjects, and lessons learned), Read, and Exercises. Furthermore, each course is supported by an Ask for help function, a Discussion list, an on-line Library, and an Exit page. Based on development of the two courses, the cost to establish a pure distance course from scratch, using the developed Project Net software, is estimated at 900 hours. This is a high estimate: it seems reasonable to expect lower costs for courses with already developed exercise material and courses adopting mixed models of teaching rather than pure distance teaching.

Implementation of the courses showed that there are no serious technical obstacles. Students access courses at all hours throughout the semester and do not experience technical difficulties. No differences in average final student marks were observed when comparing pure distance teaching and previous class-room teaching. The main future challenge is pedagogical: not all students use the e-learning materials, very few students complete all exercises, and there is a tendency for students to intensify studies at the end of the semester. All this is likely to lead to less learning. To improve the possibility for learning, future implementation of courses should establish (i) more teacher-student and student-student interaction and feed-back, and (ii) portfolio folders allowing each student to monitor their own progress. The latter would require further development of the Project Net software.

There is scope for using e-learning in all courses at KVL, especially through mixed modes of teaching. However, in order for KVL and departments to realise the potential benefits of e-learning, the university and each department need to explicitly formulate e-learning strategies. An outline of main issues to be considered in this regard is included.

**Key words:** E-learning, distance education, higher education, technology, tropical forestry

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# 1 Introduction

This chapter provides a brief overview of the history of the “Web-based teaching in tropical forestry” pilot project, describes the continuum of e-learning and discusses why e-learning is important to universities.

The Danish Centre for Forest, Landscape and Planning (S&L) at the Royal Veterinary and Agricultural University (KVL) commenced work on developing e-learning in summer 2001. In spring 2002, the pilot project on ‘Web-based teaching in tropical forestry’ was initiated with funding from KVL and S&L. The aim of the pilot project was to obtain experiences with converting university standard classroom courses to long distance learning. A first version of the courses Tropical Forestry A (KVL course no. 096222) and Tropical Forestry B (096226) was implemented in autumn 2002; the experiences gained were then used to develop and implement the first e-learning version of the course Community Forestry (096312) in spring 2003. The knowledge and experience was subsequently used to develop and implement the second version of Tropical Forestry A+B in autumn 2003.

This report presents in detail the experiences gained from developing and implementing e-learning versions of the above mentioned courses. The report also contains general observations on e-learning, such as an overview of reasons for universities to become involved in e-learning, and ends with a set of recommendations at the university, department (centre) and individual course levels. In the report, the terms e-learning, web-based teaching/learning, and long distance teaching/learning are used synonymously (see also section 1.3). Also note that the courses Tropical Forestry A and Tropical Forestry B are similar, except that students participating in the B course must also prepare a term paper. Therefore, the report refers only to the Tropical Forestry course and does not distinguish the A and B versions.

## 1.1 Objectives

As mentioned, the overall objective of the pilot project is to gain experiences in developing and implementing e-learning versions of existing courses. This report focus on: (i) providing an overview of the structure and functioning of the developed and implemented e-learning courses; (ii) presenting an overview of the experiences gained (from the viewpoint of both teachers and students); and (iii) synthesising knowledge gained into operational recommendations for use by university and department administrations as well as individual teachers interested in e-learning.

The report does not provide a full overview of the software, Project Net, used to develop the e-learning courses. It should therefore not be regarded as a guide to using Project Net.

## 1.2 What is e-learning

Basically, there is no clear definition of e-learning. The concept is broad and includes a wide range of information technologies and learning methods. For instance, e-learning may range from communication through e-mails, using internet search-engines to look up information, to virtual interactive systems. In this report, e-learning refers to the use of internet technologies to deliver a broad range of topics, at any distance, at an international competitive level within the scientific fields in

question. This is inter alia done by providing on-line course materials; structuring topics on web-pages to facilitate easy overview; providing access to different types of exercises structured around related material compiled in modules; and providing assistance to course participants through on-line discussion forums and e-mail.

In general, it is useful to think about the continuum of e-learning. Three basic levels of e-learning may be distinguished:

- Class-room teaching. This is traditional lecture based teaching using a few aids such as PowerPoint.
- Mixed models. Here teaching combines class-room teaching and use of more advanced e-learning, e.g. through the use of on-line exercises.
- Pure distance teaching. No lectures or face to face sessions, all teaching is conducted using the internet.

### 1.3 Why e-learning

E-learning may serve to increase the quality of teaching at universities. This is possible if the technology is used appropriately and if the introduction of e-learning brings about changes in how teaching is perceived among faculties. Consider the following:

- i. While there are not yet any definitive studies on the learning effectiveness of web-based teaching, existing studies indicate that students learn as much from e-learning as in the class-room<sup>1</sup>.
- ii. Using mixed models of teaching allows faculties to take the best from class-room teaching (e.g. well-taught critical discussion, personal relations) and distance learning (e.g. interactive exercises, work when you can).
- iii. Even at the best universities there is a lot of low quality class-room teaching (boring, passive, etc.). E-learning represents an opportunity to transform courses, e.g. in mixed models by moving all basic teaching from the class-room to the web and instead focus face-to-face sessions on critical discussions.
- iv. E-learning makes courses available globally. This may serve to increase competition between universities (especially if an international quality control system makes course quality comparable), leading to better courses, as they strive to attract the best students. At present, it is extremely difficult for students to find out where they will learn the most.
- v. E-learning makes teaching more visible. As courses become available globally, good teaching and teachers may become known beyond the university campus. If this eventually leads to greater recognition (such as awards and invitations), the competitiveness of teaching may improve in relation to research. At present there is no comparison between the rewards for excellent research and the rewards for excellent teaching.
- vi. E-learning promotes collaboration on teaching. Pure distance courses makes it less costly for students to complete joint degrees which thus become more attractive to establish; this could lead to better educational programmes as universities increasingly focus on what they are best at.

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<sup>1</sup> See Phipps, R.A. and Merisotis, J.P. (1999): What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education. The Institute for Higher Education Policy, Washington DC, 42pp.

- vii. E-learning promotes the formation of an international body of students. As courses become more accessible, the student body will become more international. This may serve to create a more attractive study environment and expose students to different cultures.
- viii. Due to the above, e-learning may serve to focus more attention on teaching at universities; or indeed contribute to shift the focus from how to teach to how students learn. This reorientation could result in more organised and systematic approaches to development of teaching, such as what use of what technologies at reasonable costs could improve student learning.

E-learning may also serve to increase the number of students and thus the income of universities. In 2000, internet based education was a USD 2 billion business growing by 40% per year<sup>2</sup>. Studies have shown that the demand for university education is rapidly growing, especially for degrees from North America and Western Europe<sup>3</sup>. We conducted a preliminary search for internet based tropical forestry education at university level and came up almost blank; this indicates that there may be a niche for KVL and that KVL may benefit from being among the first in this field.

There are also a number of problems associated with e-learning. Consider the following:

- i. It may be that substantial parts of a university education come from experiences that are difficult or impossible to equal electronically, e.g. meeting friends or participating in face-to-face study groups. This suggests that entire educational programmes should not be offered through pure distance teaching.
- ii. It may be difficult to keep students enrolled as they do not have access to personal counselling service or student friends.
- iii. It may be that the costs of developing e-learning based courses and educational programmes of competitive quality are too high.
- iv. There is a danger that the lure of attracting more students and thus increasing university funding will lead to focus on income generation rather than educational quality. For instance, to make money from internet based education it would be necessary to have many students while keeping the marginal student cost as low as possible; this favours low degree of feed-back and interaction and thus less learning. This suggests that a future KVL policy on e-learning should include a statement that all courses with e-learning components must be of same or higher academic quality than standard class-room courses.

Specifically at S&L, the introduction of different forms of e-learning may serve to improve the quality of courses and increase the number of students. S&L's internationalisation and educational strategies are presently being drafted; however, in relation to teaching in tropical forestry, the following objectives may be proposed:

- i. To increase the output of graduates in the MSc programme in Agricultural Development. The graduates must be qualified at an international competitive level.
- ii. To create a study environment that can recruit students from other Danish universities and from abroad, including students from developing countries.

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<sup>2</sup> Bok, D. (2003): Universities in the market place – the commercialisation of higher education. Princeton University Press, Princeton, 233pp.

<sup>3</sup> Cirijs (2003): Det internationale uddannelsesmarked – danske perspektiver. Danish Centre for International Cooperation and Mobility in Education and Training, Copenhagen, 48pp.



- iii. To increase international co-operation to strengthen the educational capacity in developing countries.
- iv. To improve the quality of the tropical forestry profile of the MSc programme in Agricultural Development by establishing collaboration with other universities in order to develop a European joint degree in tropical forestry.

Besides the general points noted above, web-based teaching can help to achieve these objectives as:

- i. E-learning does not require the physical presence of course participants. Participants can thus join courses from anywhere in the world as long as they have access to an internet connection and a computer. This will facilitate establishment of a joint degree by lowering costs for students and participating universities.
- ii. E-learning is accessible to students all over the world, including in developing countries. Pure distance courses can thus be made available on a single course basis, e.g. to persons engaged in development work who wish to receive an update, and to partner institutions, e.g. as part of capacity building projects at universities in developing countries.

Thus, e-learning may contribute to raise the profile of both S&L and KVL internationally. This may lead to other spin-offs.

## 2 Development of e-learning in tropical forestry

The courses Tropical Forestry and Community Forestry were both developed as pure distance courses. The courses are made up of around 600 web pages, including 430 pages of exercises. This chapter provides a general overview of the process of developing the courses, the basic considerations guiding the development, time required, and notes on standard course components.

### 2.1 Overview of the development process

Both courses (Tropical Forestry and Community Forestry) were offered as standard courses in the first year while work on establishing a first web-based version was undertaken. As mentioned above, the first e-learning course was Tropical Forestry in autumn 2002, while Community Forestry began integrating e-learning in spring 2003. The aim was to develop a functioning e-learning site and make it available to the students during the semester of the two courses. The e-learning site was divided into an entry page and course pages. It was decided to have a single entry page for the whole subject area of tropical forestry (as compared to an entry page for each course). The students could from the entry page navigate to the course pages they had access to. The course pages were initially divided into a course welcome page from where students then had to navigate to the modules overview page, i.e. each course subject was divided into modules, which is the e-learning version of traditional course lectures. The content of the modules followed roughly the same logical lay-out of the course overheads and compulsory literature by including the following pages: (i) Introduction, (ii) Overview, (iii) Lessons learned, (iv) Read, and (v) Exercise page. For each module, 2 to 4 exercises were developed that included multiple choice and free text exercises (see sections 3.2.3 and 3.2.4). Finally, core pages were added to the course pages, which included discussion forums and a Library page where read materials and other information were disseminated.

After the completion of the first e-learning course in Tropical Forestry and Community Forestry by summer 2003, much effort was put into developing a more user-friendly page design, an important aspect that was not given much consideration during the first development stage. This was partly due to time-constraints (i.e. it was time consuming to establish the first version of e-learning) and the fact that the involved staff had to familiarise themselves with the new software and using the internet as a learning media. The design of web-pages has in particular been changed to make content more user friendly and to improve navigation between pages. For instance, the course welcome page was changed to only include the modules overview page (to ease navigation) and the module overview page and lessons learned page was merged to one page only (see section 4.4.1 and appendices 3 and 4).

Presently, the involved faculty members are reconsidering the content and form of the e-learning courses. These considerations concern the improvement of user interactions in exercises and technical developments to support this. To improve the learning process, it has also been recognised that students should be able to monitor their own progress during e-learning courses (e.g. completed exercises, scores obtained, and discussions made). Lastly, the e-learning site needs to be personalised to improve social relations between participants - an important aspect if communication over the internet is to be facilitated. It is becoming increasingly obvious that much more attention must be paid to pedagogical issues.

## **2.2 Basic considerations guiding development**

It is the aim to make the tropical forestry profile of the MSc programme in Agricultural Development available to students globally, i.e. not only students that have access to the KVL campus. It is also expected that courses from the profile will be part of a future European joint degree in tropical forestry developed with other universities. Therefore, it was decided to develop pure distance versions of the Tropical Forestry and Community Forestry courses (rather than mixed models).

As many users, e.g. in developing countries, can not be expected to have access to a fast internet connection, powerful computers or a wide range of software, it was decided that the courses should be available to anyone with just internet access and a browser. This imposes limitations on the type of software that can be used to build the e-learning system, as well as limitations on the formats of course materials made available on the internet (see sections 2.4.1 and 2.4.3 for specifications).

It should also be noted that the Tropical Forestry and Community Forestry courses in their previous class-room form did not include exercises. However, when discussing how to transform the courses to e-learning, it was decided that exercises should form a major component of each module. The basic idea was that students should first familiarise themselves with a module (covering a subject such as deforestation), read and think about the related compendium material (and additional recommended literature if they were particularly interested in the module), and then proceed to work with the exercises. For pedagogical reasons the exercises were structured to allow participants to test their understanding of: (i) basic concepts and definitions, (ii) contents in the compendium literature, and (iii) their ability to relate theory to case studies. The level of difficulty generally increases from (i) – (iii).

## **2.3 Time required to develop a pure distance course**

The pure distance version of Tropical Forestry and Community Forestry were developed with financial support from S&L and KVL. S&L provided funding (DKK 288,000) to employ a research assistant to assist in course development and KVL provided funding to purchase software and hardware (DKK 500,000) to allow high quality scanning of text PDF files. Furthermore, a half-time TAP was made available to support the development and implementation of the used in-house software Project Net.

In Tropical Forestry and Community Forestry, approximately 2500 man-hours were used to design and adding scientific input to the e-learning system (i.e. text and exercises). Creating modules (e.g. introduction, overview and exercises) constituted the major work task - it accounted for approximately 80 percent of the work (2000 hours). In total, 30 modules were produced, which on average correspond to 67 man-hours per module. It should be noted that module exercises in Tropical Forestry and Community Forestry were created from scratch and that many modules were re-made as design and concepts developed. Developing contents with structure in place is estimated to be possible in 50 hours per module. Courses which already contain exercises could probably allocate fewer man-hours to development of exercises. Lastly, about 500 hours were used to create other web-pages (e.g. core pages such as the library page) and structuring and designing web-pages.

The estimated time to establish pure web-based teaching for a course is provided in table 1. Only the time-budget for creating scientific input is provided. The time-budget for developing software, page

design, structural page set-up and guide to first time users is not considered as this has already been done for Tropical Forestry and Community Forestry. Other courses would benefit from this. Assuming that a course on average consists of 15 modules, a pure distance course would require 918 man-hours, corresponding to approximately 25 weeks. The cost for mixed model courses would be lower if the number of modules and exercises were lower. Likewise, courses with already existing exercises would need less time to develop the exercise part of each module.

**Table 1** Total man-hours required to develop a pure distance course with 15 modules

Activity	Man-hours	Total man-hours
Getting started with Project Net	37	37
Creating welcome page	10	10
Creating discuss, ask for help and exit page	20	20
Creating library page	37	37
Administrative tasks (e.g. converting text into PDF, user-administration, upload materials to the server, etc.)	64	64
Creating module (e-learning lecture) -Introduction (including quotation), overview (purpose, subject and lessons learned), read and exercise page -Multiple choice and free text exercises	10 40	750 <sup>1</sup>
<b>Total</b>		<b>918</b>

<sup>1</sup> In the case where the course contains 15 modules (i.e. e-learning lectures)

## 2.4 Overview of standard course components

### 2.4.1 Choice of software

Different software provides different technical and pedagogical options. The project staff studied the software: Lotus LearningSpace, ABC Academy, Project Net, and Cumulus. Choice of software was discussed at length. It was agreed that the following criteria were important when deciding what software to use:

- i. Pedagogical design. Software should be easy to use and understand (both from the viewpoint of faculty and students).
- ii. Contents. What does the software allow (e.g. on-line supervision, exercises, etc.).
- iii. Future up-dating and development. Software that is likely to be continuously up-dated and developed should be preferred.
- iv. Integration with CampusNet. It should be possible to integrate the material developed with CampusNet; i.e. we should have full control of data (data flexibility).
- v. Financial considerations. Software should not be too expensive to purchase or up-date; software should not have to be purchased by students.
- vi. Generalisation. Software should be relevant to use for a majority of Centre and KVL courses.
- vii. Time of availability - when software can be up and running. The sooner the better.

During the discussion of what software to choose, the importance of making the choice in collaboration between scientific and technical staff became obvious: there are both pedagogical/user and technical/administrative issues that need evaluation. It was decided to use Project Net, developed at S&L, for developing the e-learning courses. Project Net (a web content management system that connects users over the internet) was chosen as this ensured full data accessibility and flexibility, which was found to be of major importance, in particular in the light of the present rapid development of e-learning software, i.e. the software may be exchanged with other software within a few years.

#### **2.4.2 Main categories of developed web pages**

The web-pages developed in the e-learning system can be divided into three main categories (they will be elaborated in detail in chapter 3):

*Entry page:* It was decided to have a single entry page for the whole subject area of tropical forestry (as compared to an entry page for each course). This gives participants, when they key in their password, access to all the courses they are signed up to via a single page. This is practical and will serve to present the tropical forestry courses as a coherent unit.

*Course pages:* Each course is similar in structure, facilitating easy use by participants – once they are familiar with the structure of one course they can easily access other courses that they sign up to. Course pages include: (i) the main course page (overview of e-learning modules), (ii) core pages (ask for help, discuss, library and exit pages), and (iii) module pages for each individual e-learning lecture (introduction, overview, read and exercise pages).

*Administration pages:* The e-learning pages also contain a button titled “Admin”. This provides the course responsible teacher(s) access to edit course contents and user access.

#### **2.4.3 On-line teaching material**

Both courses use compendia. Making these available on-line (as opposed to hard copies in the university bookshop) would: (i) make all material immediately available to all students signed up for the course; (ii) make up-dating the compendium easier, and (iii) force students to visit the course homepage and familiarise themselves with the many functions and information available. However, picture PDF files are too time consuming for students to download and print. Compendium sources have to be available as text PDF files. S&L has recently acquired the necessary hardware and software to scan material as text PDF files.

Unfortunately, due to dispute between COPY DAN and the Danish universities, KVL and S&L are not allowed to distribute teaching material electronically. This is illegal and each course responsible teacher posting copyrighted electronic material, even on an internal network behind passwords, is liable to legal action. Unless and until the dispute is settled, e-learning courses have to rely on distributing hard copies of teaching material. This is severely limiting the development of on-line materials; this is otherwise a very promising area for improving teaching material, e.g. individual sources can be hyperlinked and teaching staff can add their comments, sound files, photographs, etc., to the material. Due to the dispute, development of on-line material, beyond having text PDF files ready for distribution, has not been pursued in Tropical Forestry and Community Forestry.

#### **2.4.4 Pedagogical considerations**

E-learning has some advantages over traditional face-to-face teaching: (i) the students can study when and where motivated, (ii) the computer has unlimited patience and can thus be used for exercises again and again, thus (iii) making e-learning optimal for basic modules and exercises (containing all the background information participants need to become operational, e.g. terminology). E-learning also provides the opportunity for teachers to monitor student progress during the course (in future versions of the e-learning system students will also be able to monitor their own progress). On the other hand, e-learning also has short-comings, in particular when it comes to developing the participants' ability for critical analysis and discussion. Integrating more pedagogical considerations into implementation of courses seem to be the main challenge in the future (see chapters 4 and 5).

### 3 Description of the e-learning system developed

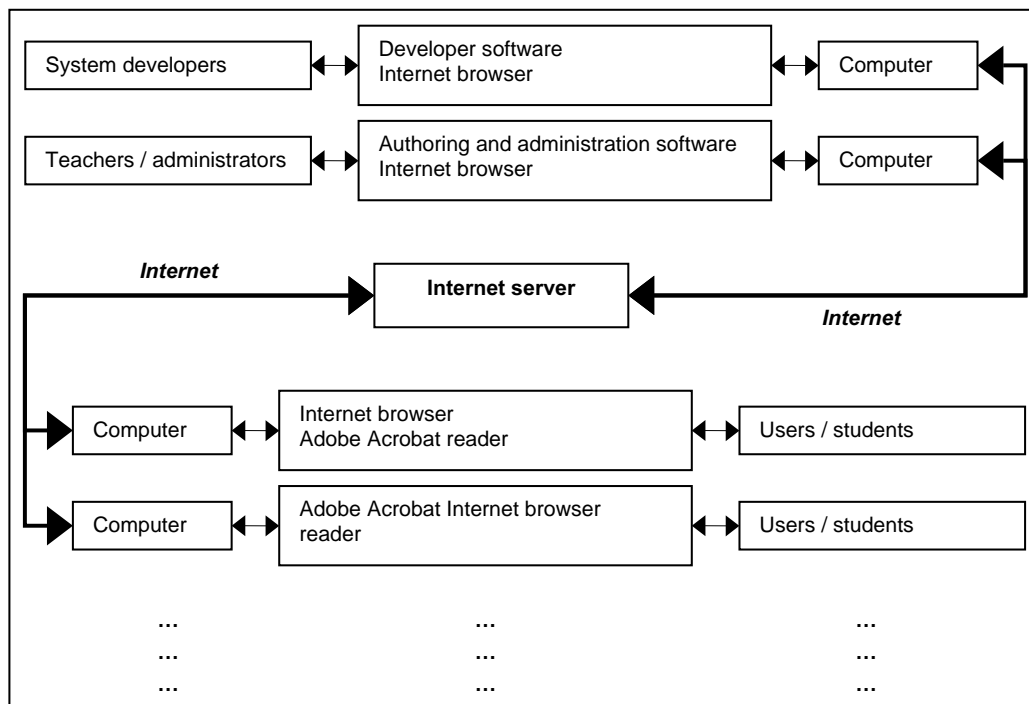
This chapter provides in-depth details on the e-learning system, the web-site structure, and the individual web pages available to students and teachers/administrators.

#### 3.1 System and web-site structure

The overall structure of the e-learning system developed for the tropical forestry courses is depicted in Figure 1. The system allows all three groups (i.e. users/students, teachers/administrators and system developers) to work simultaneously with e-learning from any computer anywhere, as long as they have internet access, a browser and Adobe Acrobat Reader (download for free).

The system consists of an organised set of web pages saved on an internet server. These pages contain:

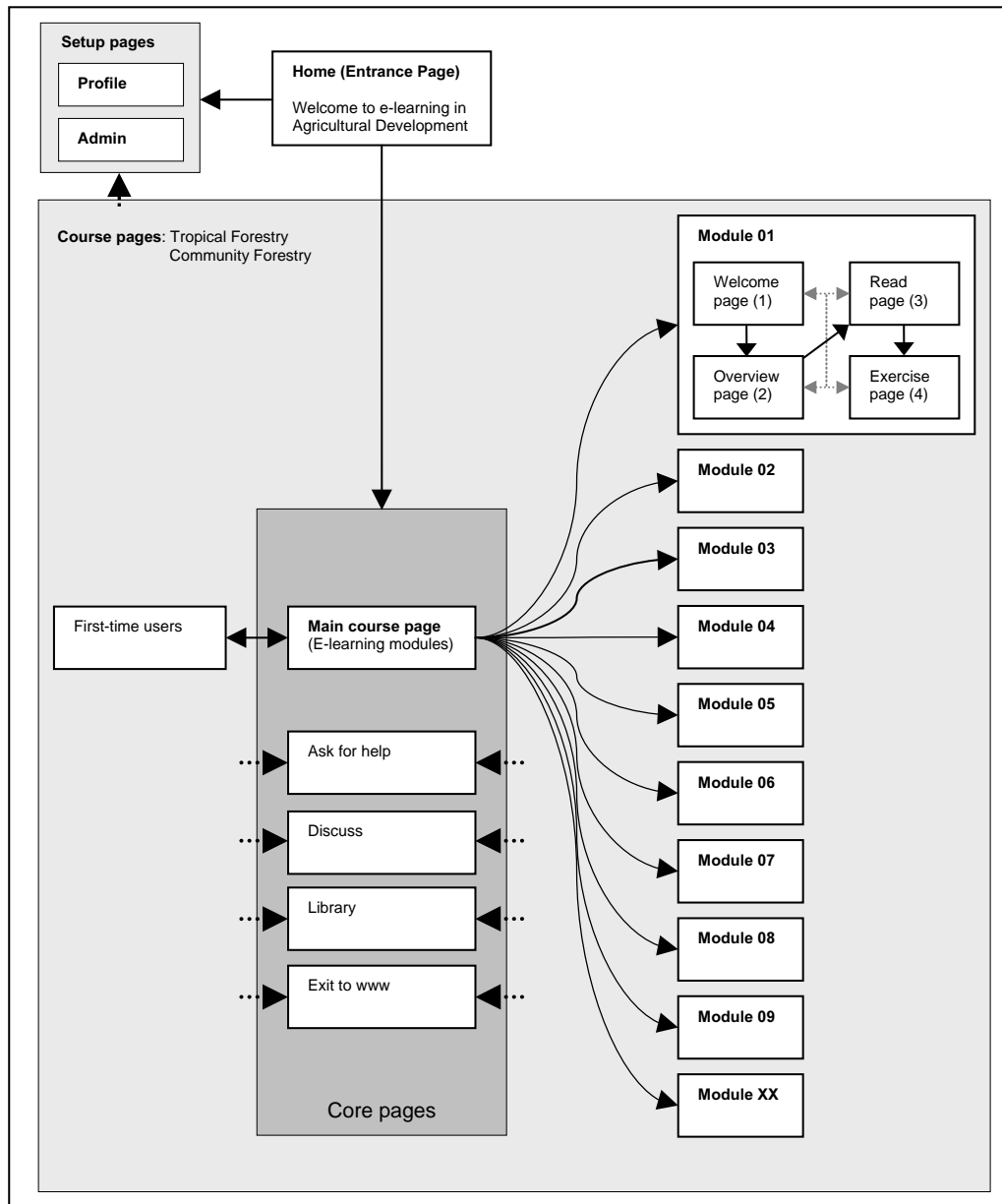
- i. Hypertext (text with links)
- ii. Photographs and illustrations (tables, figures, drawings and other graphics)
- iii. Dynamic contents (exercises, shared file archives, discussion lists, etc.)



**Figure 1** The system used in web-based teaching in tropical forestry courses (... indicate that a large number of users / students can benefit from the system simultaneously).

System developers create, maintain and update the system, which makes it possible for teachers / administrators to create web pages, author hypertext documents and use dynamic contents to communicate scientific material to users / students as well as manage user / student access.

The website structure and interrelations between web pages is illustrated in figure 2. Both Tropical Forestry and Community Forestry have the same structure and interrelations between web pages to make it user-friendly to course participants. The content of the web pages in figure 2 is elaborated in sections 3.2 and 3.3.



**Figure 2** Structure of the website and web-page interrelations in Tropical Forestry and Community Forestry. Core pages are always within the reach of a single mouse click. The extended Module 1 illustrates the general structure of modules and the normal sequence of navigation as indicated by the bold arrows.



## 3.2 User/student pages

This section shortly presents the different pages available to the students. The pages are presented in the logical sequence from the user's point of view.

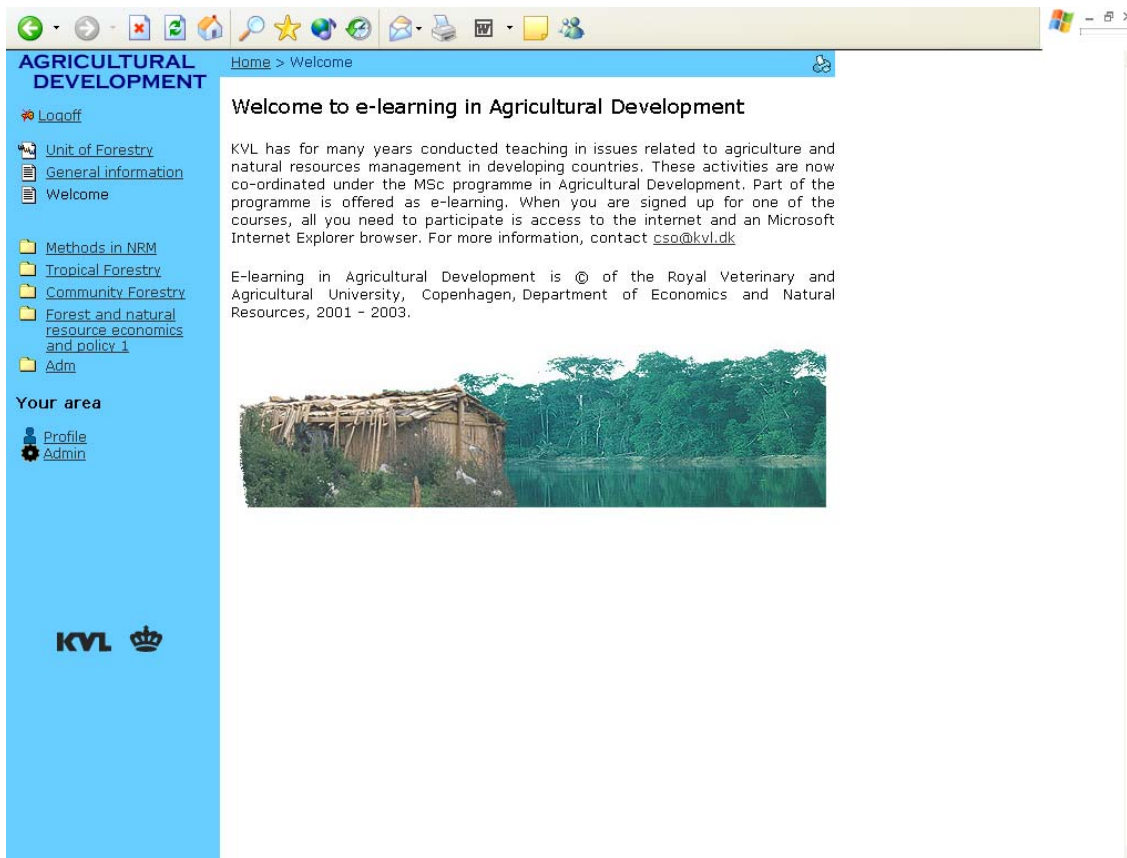
### 3.2.1 Home and Entrance page

Students enter the e-learning system through the home page (the Agricultural Development Welcome Page, [www.flec.kvl.dk/ad](http://www.flec.kvl.dk/ad)) where they key in their username (always an email address) and password before they gain access to the courses. Students receive an automatically generated password by email after the administrator has signed them in (using their KVL email address, see section 3.3.3). From the home page, the whole subject area of tropical forestry is available. The home page has, as all subsequent e-learning pages, two frames: a left frame for easy navigation and a right frame displaying contents (see figure 3). On the home page, the left frame allows participants to enter the course(s) they are registered for. For instance, clicking on Community Forestry will take the student to that course. As indicated in figure 3, four courses presently use Project Net for e-learning. Additionally, the left-hand frame contains links to:

- i. *Unit of Forestry* (provides a link to the Tropical Forestry homepage)
- ii. *General information* (about e-learning courses in general)
- iii. The courses which are available to the student (i.e. *Methods in Natural Resource Management, Tropical Forestry, Community Forestry and Forest and Natural Resource Economics and Policy 1*)<sup>4</sup>
- iv. *Profile* (here the user can view and edit her profile and password)
- v. *Admin* (takes the administrator/teacher to the administration pages)

---

<sup>4</sup> E-learning, using the structure and approach developed for the Tropical Forestry and Community Forestry courses, was adopted in mixed mode of teaching in *Methods in Natural Resources Management* (3 modules, autumn 2002) and *Forest and Natural Resource Economics and Policy 1* (8 modules, autumn 2003). Findings were (i) a very positive reception of e-learning in mixed mode teaching, and (ii) that multi-department courses with many involved teachers should agree on approach and changes before these are initiated.



**Figure 3** The Home and Entrance Page. Having logged in, the courses the user / student are registered for appear as folders in the left-hand menu (white arrow). Students then choose the course they wish to work with.

### 3.2.2 Main course page (E-learning Modules)

After having chosen a course from the home page, the user is guided to the main course page (figure 4) which provides an overview of and access to each module in that course. The term module is used as similar to the term lecture in an ordinary class-room course. In the left-hand frame bar participants have access to core pages, i.e. pages that are used frequently or in one way or another are considered important for the e-learning process (see figures 2 and 4). The core pages can be accessed from the main course page and all subsequent course pages under each module. They include:

*Ask for help:* Students can use this page to ask questions related to technical problems or issues. For instance, students may experience problems with the e-learning system (e.g. finding a non-working link) or just have some clarifying technical questions (e.g. why they can not download a case text).

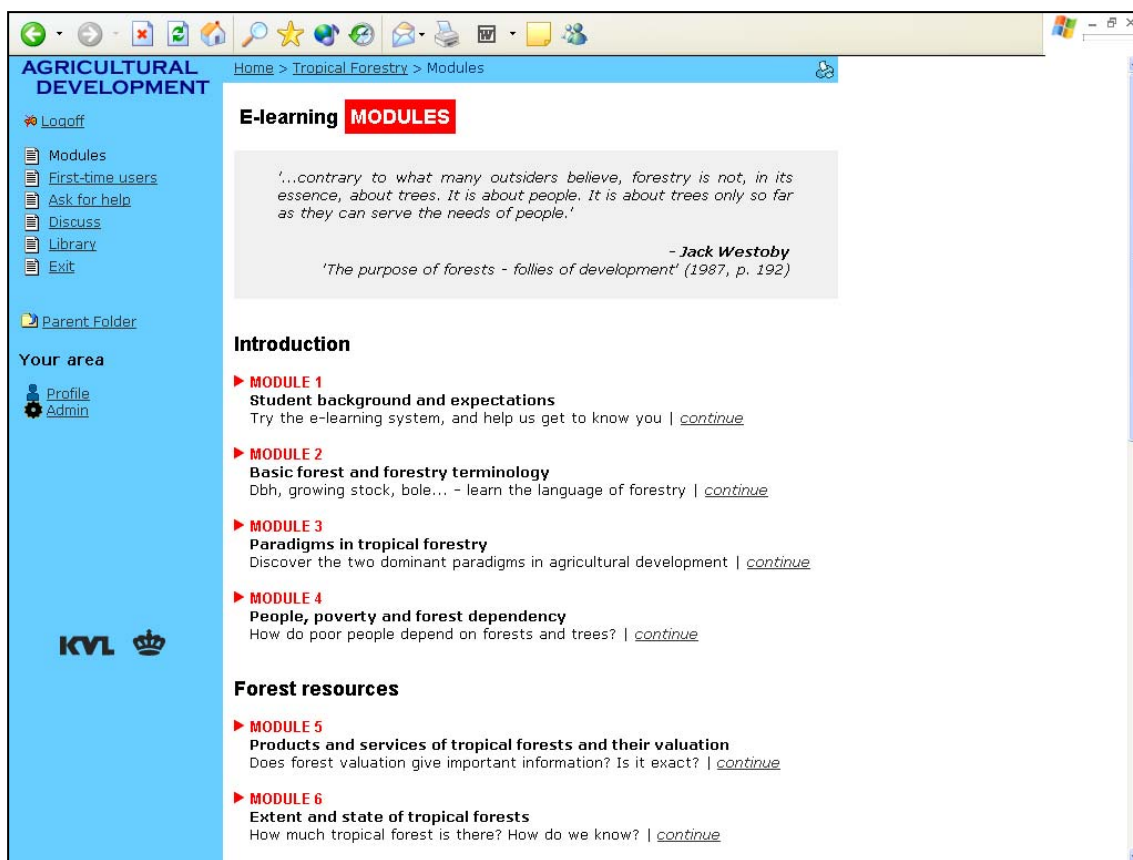
*Discuss:* On this page, students have the opportunity to post and discuss scientific questions related to each module. For example, students may wish to clarify or discuss subjects, questions or answers in a module. All questions and answers are public to the course participants so each can follow and contribute to the discussion.

*Library:* From this page students have access to online resources such as e-learning material in text PDF format (e.g. case studies, questions for each module exercise, brief introduction notes, etc.),

references to literature and quotations, and links to key online data and information resources. At present, however, most of the compendium material is not available due to legal reasons (see section 2.4.3).

*Exit:* The exit page provides links to useful web sites such as search-engines and development information sites.

*First-time users:* Provides guide to e-learning, e.g. an introduction to the web-site structure, exercises, and information about software required and how to change personal settings.

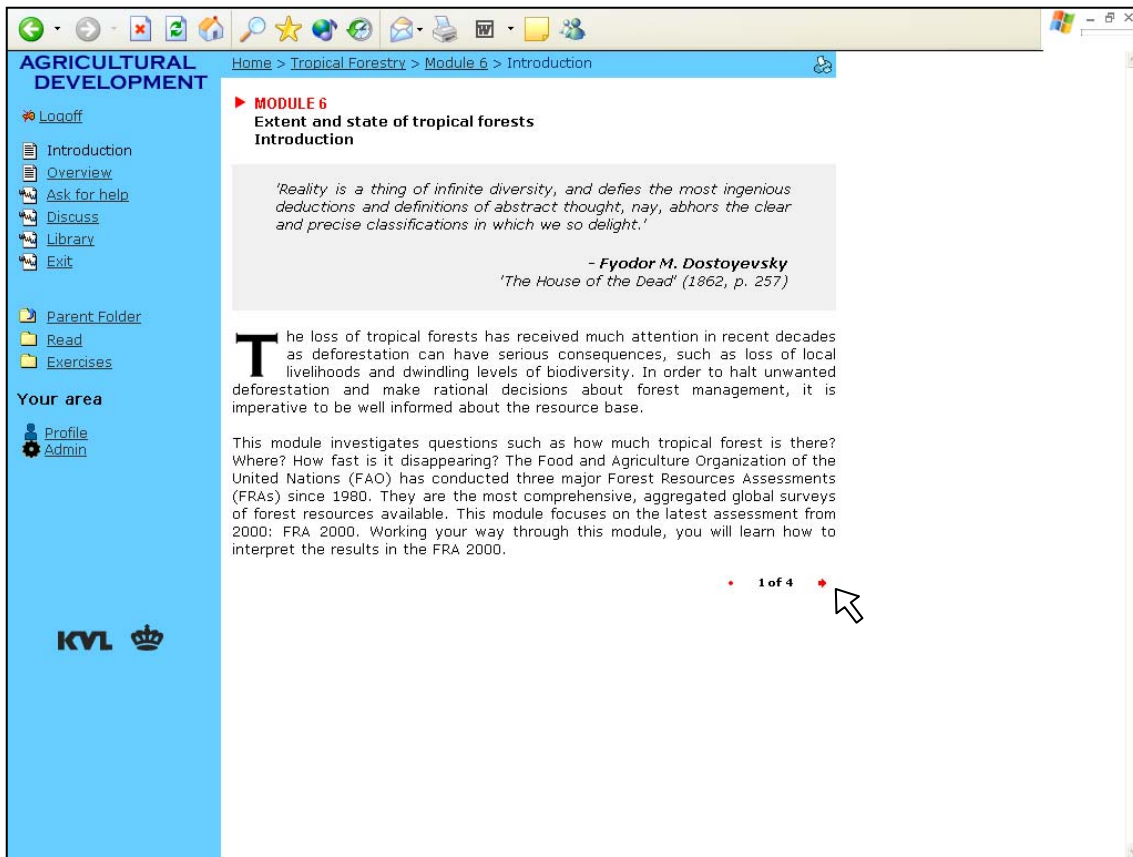


**Figure 4** The main course page. After having chosen a course from the home page users will enter the main course page (in this case the Tropical Forestry course). All modules are accessed from this page by pressing the continue button (white arrow).

### 3.2.3 The module pages

In the e-learning courses, material is organised in modules. Each module contains four web pages that guide the student before starting the exercises. The details of the four pages are:

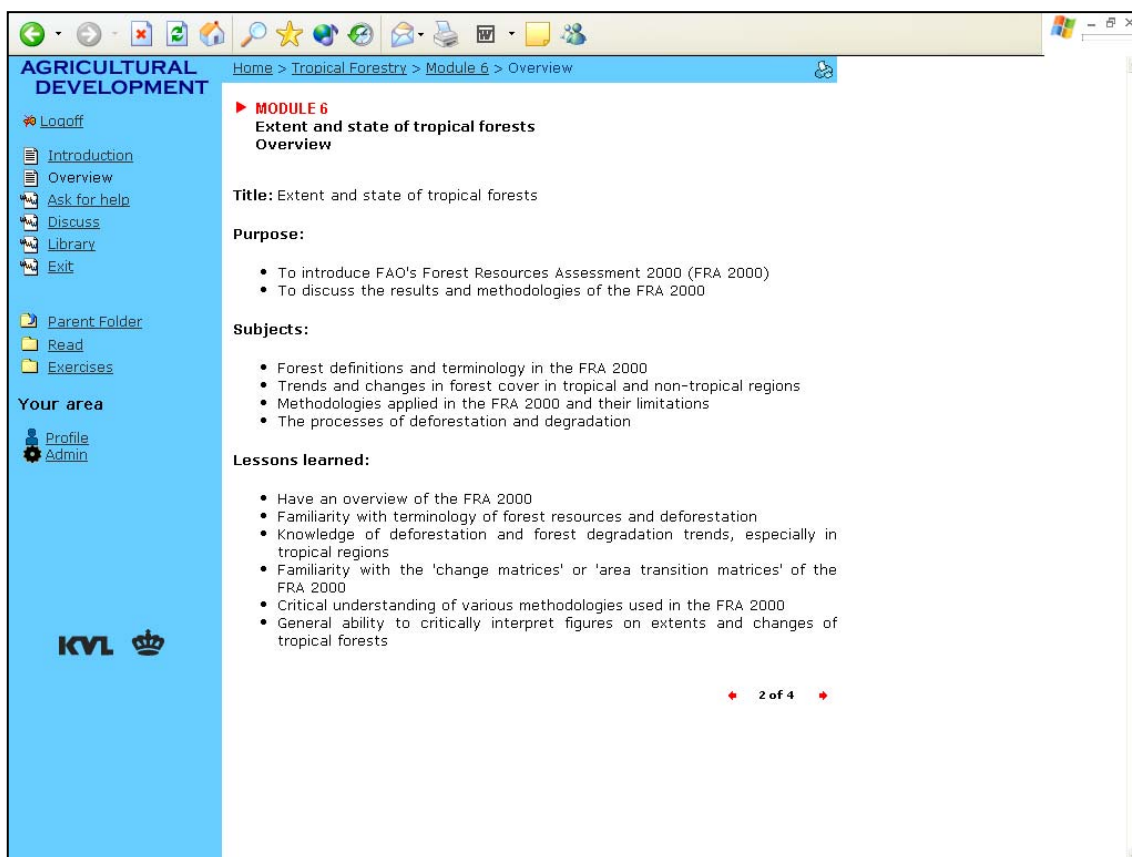
The “*Introduction*” page (1st page) introduces the content of the chosen module by emphasising, e.g., historical aspects and/or important issues related to the topic. The introduction page also contains a quote that serves as inspiration to the module. It also specifies what students should learn from completing the module. Students are guided through the module pages by pressing the red arrow in the bottom-right corner of the page (see figure 5).



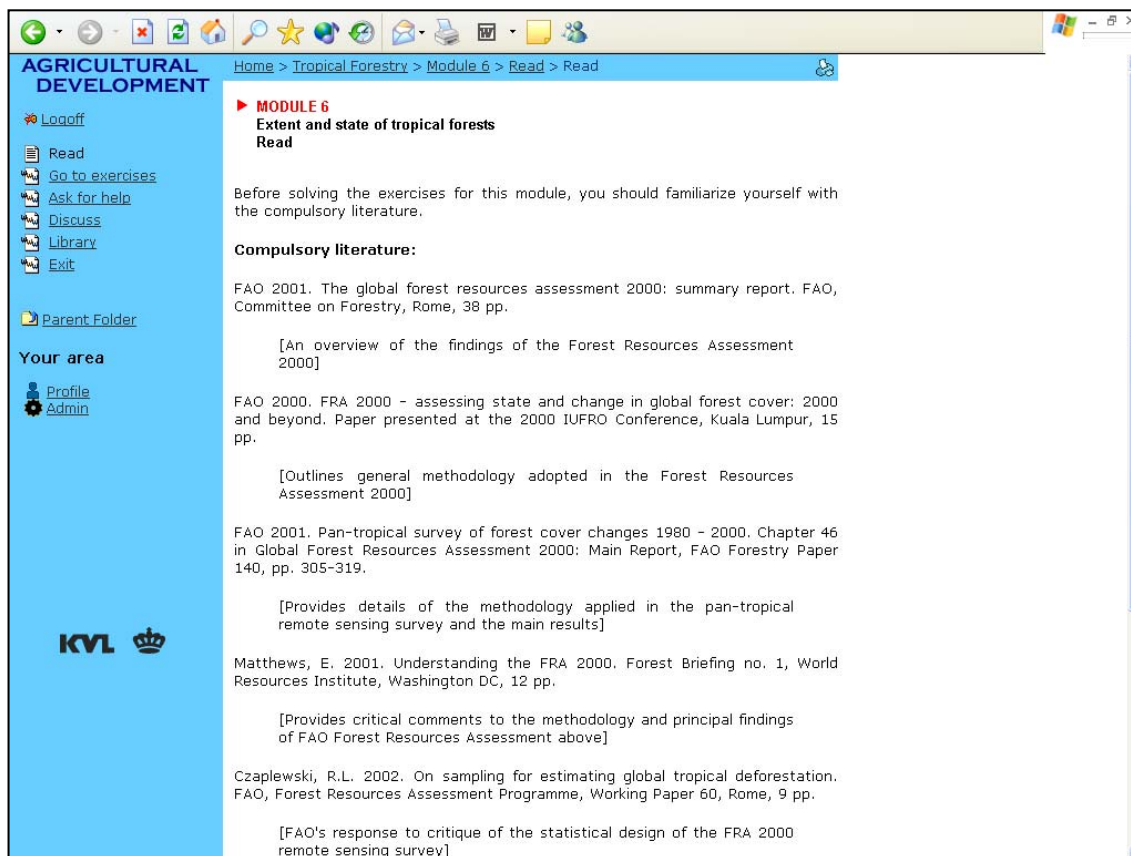
**Figure 5** The module “introduction” page. The page contains a quote (grey area) and a short introduction text below. The red arrows guide the user through the module (see white arrow).

The “Overview” page (2nd page) specifies the purpose, subjects and lessons learned in the module. The page aims at providing the students with a clear overview of the content of the module and what issues are important to understand. A bullet marks each issue (see figure 6).

The “Read” page (3rd page) presents the material that course participants should read before starting the exercises. Some material can be downloaded from the read page, such as reports available on the internet and supplementary comments from the teacher (see figure 7).

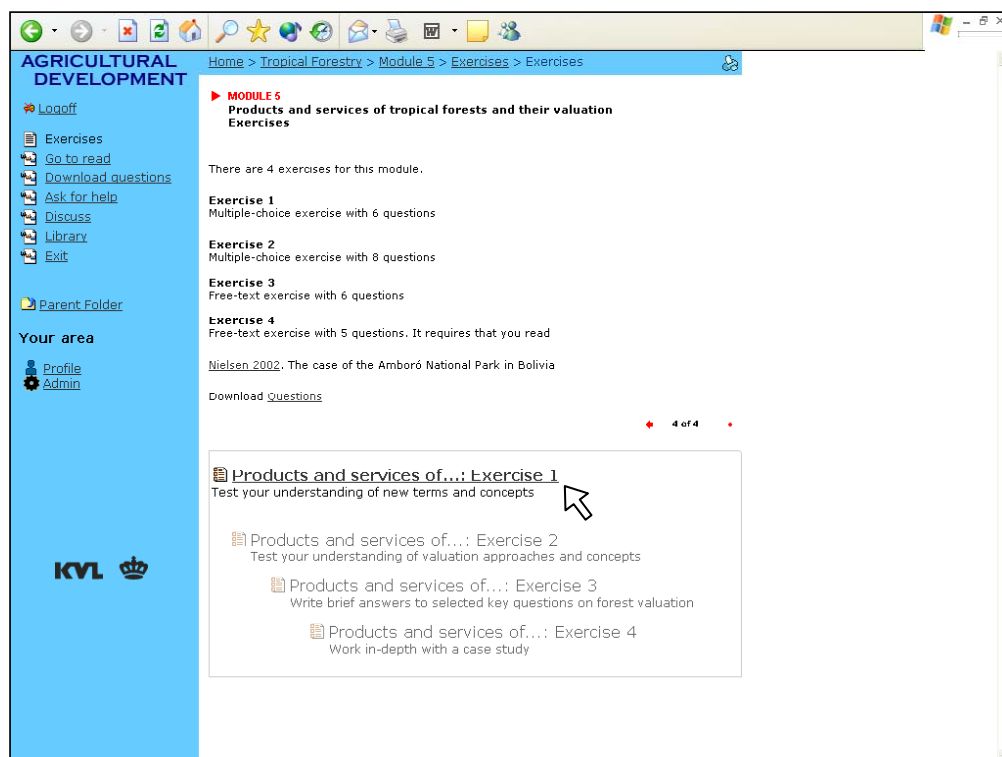


**Figure 6** The module “overview” page. The page is divided into purpose, subjects, and lessons learned.



**Figure 7** The module “read” page. Compulsory literature is briefly introduced as is suggested further reading (not visible in this figure).

The “Exercise” page (4th page) briefly introduces the exercises to the user: how many and what type of questions (i.e. multiple choice or free text exercise). To save potentially costly online time, the questions can be downloaded before commencing the exercise (see figure 8). Exercises are completed in the hierarchical order displayed in figure 8 below, i.e. students cannot commence exercise 2 before exercise 1 is completed and so forth (but Project Net allows teacher to change this as required).



**Figure 8** The module “exercise” page. Exercises are accessed by pressing the link in the box (see white arrow). The exercise box is an example of how dynamic content is added to web-pages.

### 3.2.4 Module exercises

Module exercises can either be based on multiple choice exercises, free text exercises (where students write a short essay), or a combination of the two. In exercises, students can test their understanding of terminologies and content of module subjects, and their ability to use this knowledge in case studies. Exercises are therefore normally arranged in the sequence displayed in table 2.

**Table 2** The four different types of exercises

Type	Purpose of exercise	Form of exercise	Level of difficulty
I	Tests students’ understanding of basic definitions, terminology and concepts presented in the read material of the module	Multiple choice exercise	Easy – Moderate
II	Tests students’ general knowledge and understanding of the subjects presented in the module	Multiple choice or free text exercise	Easy – Moderate – Difficult
III	A free text exercise usually based on a small case study	Free text exercise	Moderate – Difficult
IV	An advanced exercise where the students’ ability to use module material to analyse a case study is challenged	Free text exercise	Difficult

Each module contains from 2-4 exercises. For pedagogical reasons exercises are completed in the order displayed in table 2, i.e. students have to finish the Type I exercise before they gain access to the type II exercise and so on.

The multiple-choice exercises usually contain 8 to 10 questions, whereas free text exercises contain 3 to 5 questions. Students can only complete exercises once during the semester. After students have completed an exercise the results are revealed to them, i.e. in multiple choice exercises the student can see which options they have chosen and compare them with the correct answers (an example of how multiple choice answers are displayed can be seen in figure 24). In free text exercises a possible answer is provided. At the end of the semester, before the examination period starts, all answers are deleted and the exercises are made available to the students one more time. Students have, however, always access to results of the completed exercises during the whole semester.

In figure 9 below, different layouts and questions from different exercise types are presented. As can be seen, the software allows a wide range of choices in designing exercises as it is possible to include tables, figures, photographs, etc.



1. Indirect use values

Which of the following values associated with forest contributions may be categorised as an indirect use value?

☐ 1. Recreation  
☐ 2. Watershed protection to provide clean water  
☐ 3. Biodiversity protection for future use of e.g. domesticated plants  
☐ 4. The collection of non-timber forest products for subsistence  
☐ 5. Soil productivity on converted forest land  
☐ 6. The protection of the habitat in which the Panda lives

Submit Reset

5. Calculation exercise

Based on the fictive figures in the table below, what are the estimated gross deforestation and net deforestation rates through the period? (The figures are fictive and should not be compared with the rates from the pan-tropical survey.)

	Forest Classes			Non Forest Classes			
	Closed Forest	Open Forest	Long Fallow	Shrubs	Other Land Cover	Water	Total 1990
Forest Classes							
Closed Forest	250	3	3	2	10	3	271
Open Forest	1	500	1	1	5	0	508
Long Fallow	2	4	100	1	3	0	110
Non Forest Classes							
Shrubs	1	2	1	200	3	1	208
Other Land	1	1	1	1	1000	0	1004
Water	0	0	0	0	0	50	50
Total 2000	255	510	105	205	1021	54	2153

☐ 1. The gross deforestation rate is 18 million hectares  
☐ 2. The gross deforestation rate is 19 million hectares  
☐ 3. The gross deforestation rate is 25 million hectares  
☐ 4. The net deforestation rate is 18 million hectares  
☐ 5. The net deforestation rate is 19 million hectares  
☐ 6. The net deforestation rate is 25 million hectares

Submit Reset

3. Expert opinion approach

Use the figure below to describe, in your own words, the process of verification of country level data used in the FRA 2000

Submit Reset

3. Schools of deforestation

In order to classify the process of deforestation presented in the case study, categorise the following according to the schools of deforestation: (i) the principal agents of deforestation, (ii) the driving dynamics of deforestation, and (iii) policy options

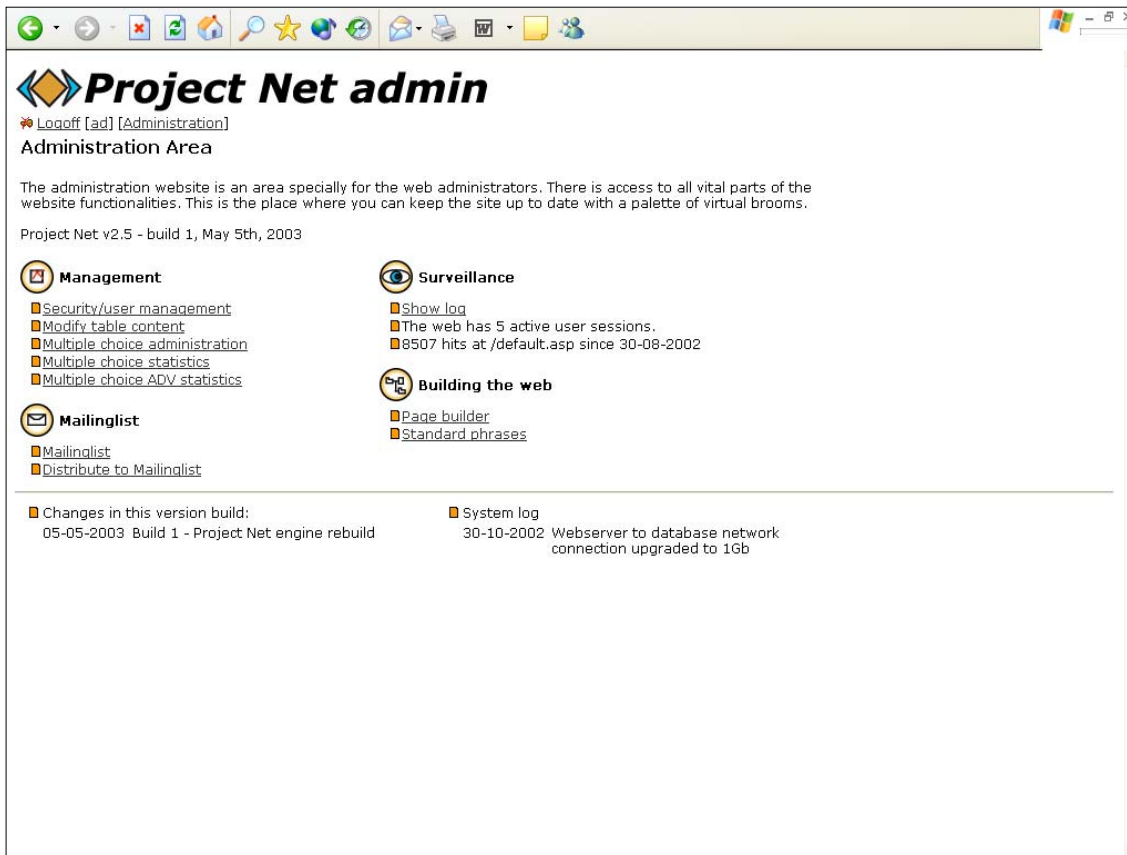
Submit Reset

**Figure 9** Examples of exercise questions. 1) Type I multiple choice exercise in basic terminologies (in this case about indirect use values). 2) Type II multiple choice exercise in basic understanding of course subjects (in this example about FAO's change matrix). 3) Type II free text exercise in understanding course subjects (about the FAO expert opinion approach). 4) Type III or IV case study exercise (about schools of deforestation).

### 3.3 Teacher/Administrator pages

Administrator / teacher pages are those that course responsible staff uses to (i) build the web site and (ii) manage users / students. These pages constitute the administrator interface. The single most important administrator page, the 'Project Net admin' page, is shown in figure 10. From here, the administrator navigates to other admin pages. All admin pages are accessed through the internet, which

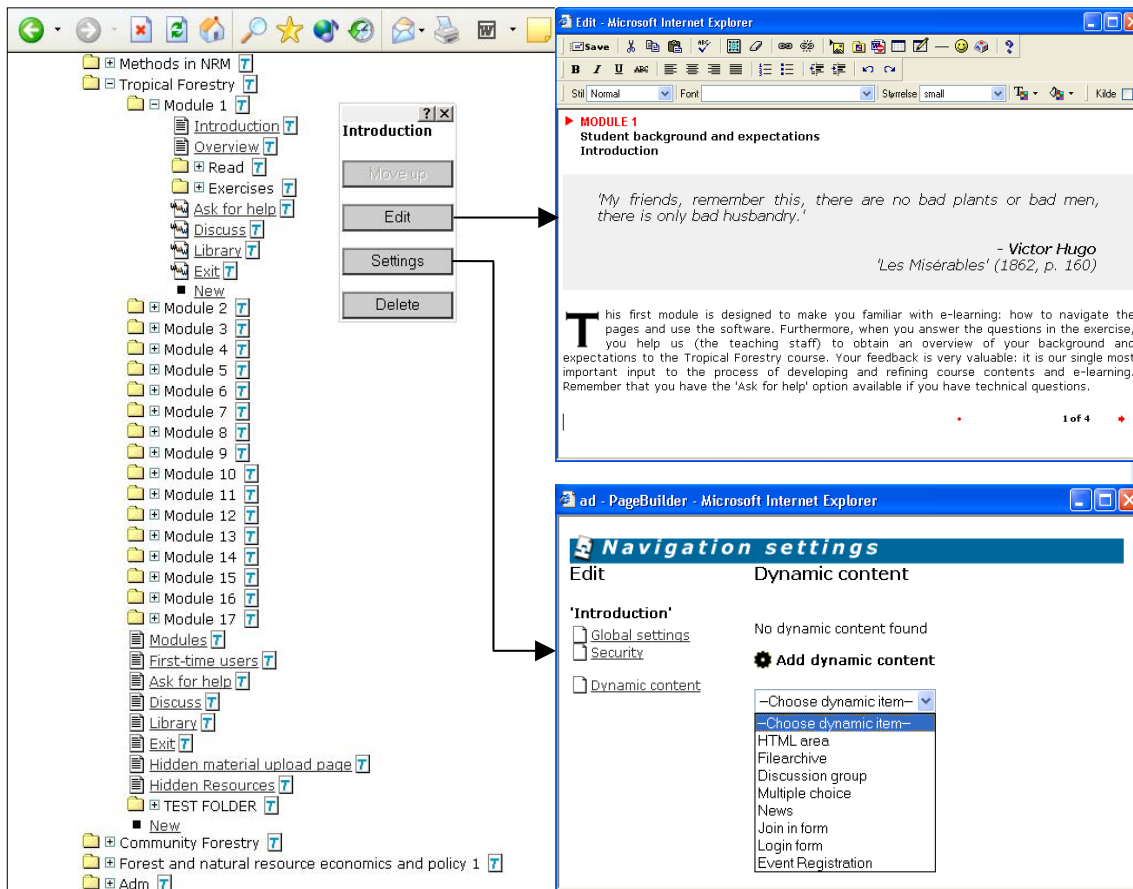
means that the administrator/ teacher, like students, is not bound to any physical location. The two most important and most used admin pages are the Page builder and the Multiple choice administration.



**Figure 10** The ProjectNet admin page - the principal administrator page.

### 3.3.1 Page builder

The page builder (figure 11) is used to build up and structure course pages. Folders are used to organise pages, i.e. there is a folder for each course, in course folders there is a module folder for each module, and in module folders are included read and exercise folders. In each folder the appropriate web-pages and links are added. The administrator assigns read access to folders and web-pages, which determines who has access to the pages.



**Figure 11** The tree structure on the page builder page: are folders, are links and are web pages. By clicking the + next to the Tropical Forestry folder, you enter the course-specific folder where all module folders and subsequent web pages used for this course are located. The administrator can add pages by pressing the New button (white arrow) or edit page contents, change settings or delete pages by pressing the edit item button (it has here been clicked for the Introduction page in Module 1). Clicking Edit in the edit item box opens the text editor used to author hypertext documents (window in the upper right corner) - in this case the contents of the 'Introduction' page in Module 1 is displayed. To complete editing, the page is saved to the server by clicking the 'Save' button (white arrow). The Settings option in the edit item box is used to fix Global settings (title and type of item, e.g. folder, link, or web page), Security (who can read the page) and Dynamic contents. In the window in the lower right corner, the Dynamic contents dialogue is shown. The administrator can add dynamic contents (in this case to the introduction page in module 1) of the types shown in the drop down menu: File archive, Discussion group, Multiple choice (this includes all types of exercises), etc.

Each folder contains a default web-page, i.e. a page that automatically is uploaded when the user is redirected to that folder. For instance, in the Tropical Forestry folder the Modules page is the default page (see figure 11).

Folders, web-pages and links are added in page builder by pressing the New button (see figure 11). The New button is available in all folders which make it possible for the administrator to add items (i.e. folders, web-pages and links) in the appropriate folder. One of the most important and powerful features of Project Net is that added items receive unique URL-addresses which are used to structure the interrelations of web-pages through links.

The text editor in page builder is used to design and author hypertext on web-pages. It is activated by pressing the edit item button (see figure 11). It is also in web-pages that dynamic content is added. The most used dynamic contents in Project Net are the file archive (which is used to upload read materials to the SQL server), discussion group (where students and teachers communicate course subjects) and multiple choice exercises. The file archive is a very useful feature in Project Net, which provide the administrator with several advantages. First, uploaded documents receive unique URL-addresses, which are used to make read material available to students on web-pages (e.g. the Read page). Second, all read material is stored in one place and they can be updated, without changing the URL-address, when needed. This ease the management of read material.

### **3.3.2 Multiple choice administration**

The multiple choice administration page is used to create, edit or delete multiple choice exercises (figure 12). The figure below illustrates how exercises, questions and options are added to the multiple choice administration (see figure 9 for different possible question layouts). When an exercise is created it is made available as dynamic content and can then be added to a web-page in page builder.

**Project Net admin**  
Logoff [ad] [Administration]  
Multiple Choice administration

Basic forest and forestry terminology: Exercise 1

[Add new Multiple choice exercise](#)

**Basic forest and forestry terminology: Exercise 1**

1. Land use term

option title	%	Edit, Correct, Delete, Move-up
1. Tree-enhanced agriculture	-33	[T] [X] [U]
2. Agroforestry	100	[T] [X] [U] [A]
3. Tree-supported agriculture	-33	[T] [X] [U] [A]
4. Arboriculture	-33	[T] [X] [U] [A]

[Add new Option](#)

Germ Total value (100)

[Equal weight](#)

2. Measure of tree size

option title	%	Edit, Correct, Delete, Move-up
1. Diameter at breast	50	[T] [X] [U] [A]

**Edit multiple choice exercise**

Title: Basic forest and forestry terminology

Description: Test your knowledge of terminology

Finish reply: This text is shown to the user, when the questionnaire is completed:  
[Click to edit](#)

Sequel: The current exercise will only be available after finishing this multiple choice exercise:  
Basic forest and forestry terminology: Exercise 1

Show statistics: ☒ After completing the questionnaire, the user will be shown a summary of the answers and whether the questionnaire is correctly filled out.

Active: ☒ Is this questionnaire available?

Security: The current exercise is only available to:  
☐ Public  
☐ Internal  
☒ Administrator  
☐ Registered user  
☐ Internal coordinator  
☐ Guest  
☒ Tropical Forestry  
☐ Community Forestry  
☐ Methods in NRM  
☐ Forest and natural resource economics and policy 1

[Submit](#) [Reset](#)

**New question to "Basic forest and forestry terminology: Exercise 1" - Multiple Choice exercise**

Question: 1. Land Use Term

Text: [Click to edit](#)

Type: [Choose type](#)

[Submit](#) [Reset](#)

**New option to "1. Land use term" - Multiple Choice question**

Question Text: "Which general term is used for land use systems where woody perennials are grown within the same field as agricultural crops? An example would be a system where the nitrogen-fixing tree species *Leucaena leucocephala* (Lam.) de Wit is planted in rows in fields where maize is also grown"

Option text: 1. Tree-enhanced agriculture

Correct: ☐ This property cannot be changed.

Free text: ☐ This option will be a free text as answer to the question. This cannot be changed once the option has been created.

[Submit](#) [Reset](#)

**Figure 12** The multiple choice administration page. Exercises, questions and options can be added, edited or deleted in the multiple choice administration. In window A, the settings of an exercise is applied, i.e. title of exercise, whether a summary of the users' answers and correct answers should be displayed at the end of the exercise, which other exercises should be completed before the exercise is made available and which users have access rights. In window B, questions to the exercise are added or edited and the type of question is applied (i.e. free text answer or multiple choice). In window C, the options to the question are added. Correct options/answers are declared by ticking of the correct box (only for multiple choice questions). Lastly, equal weights in percent are assigned to each option (only for multiple choice questions, see white arrow; different weights can also be given). Negative weights are given to incorrect answers while positive weights are given to correct answers. The total score of the weights is zero.

### 3.3.3 Pages used to manage users/students

How administrators manage user/students is illustrated in figure 13 below. When new users are added they automatically receive a username and password by email. It is also possible to deactivate and activate users.

**Figure 13** The Security/user management page. The page is used to create new users/students and modify their attributes. Adding or editing users is done through the user administration web page dialogue. Asterisks (\*) indicate fields that must be filled.

### 3.4 Technical introduction to Project Net 2.5

Project Net is a Web Content Management System which facilitates communication between people connected to the Internet. The Agricultural Development website is build with Project Net 2.5 Server Software and Active Server Pages 3.0 technology on an Internet Information Server 6.0. Data is stored on a dedicated Microsoft SQL Server 2000 sp3 Database Server. Web and Database servers are configured with Microsoft Windows 2003 Server software.

Hardware requirements are dependent on expected amount of data and extend of use. In medium/low use scenarios such as the Agricultural Development website, hardware requirements match Microsoft Windows 2003 Server requirements.

### 3.5 Overview of users, tasks and software

An overview of the main tasks, or responsibilities, of the three interest groups and required software is presented in table 3.

**Table 3** Main tasks/responsibilities and software requirements for the three main interest groups involved in developing web-based teaching in tropical forestry at S&L

Interest group	Tasks/responsibilities	Software required
<b>System developers</b>	Develop system in accordance with the desires and aspirations of the other two main interest groups Keep the system running Document system specifications Create system manual	Project Net 2.5 Server Software Active Server Pages 3.0 Internet Information Server 6.0 Microsoft SQL Server 2000 sp3 Database Server Microsoft Windows 2003 Server software
<b>Administrators / teachers</b>	Supply university course  Develop scientific profile Curriculum development Teaching / supervision  Project management: web-based teaching / e-learning  Identification / design alternatives / choose solution / implement / manage: continuous development, production, marketing, etc  Administrate the e-learning course  Author and publish to web scientific contents: overview pages, exercises, teacher-evaluated assignments, etc Manage user / student profiles and access in Project Net Answer user / student questions posted online, etc Supervise student progress	Microsoft Internet Explorer 6.0 Project Net's administrator interface Project Net's text editor Text processor (e.g. Words) Basic text editor (e.g. Notepad) PDF creation software (e.g. Adobe PDF Writer) Digital imaging software (e.g. Adobe Photoshop, Corel Photo-Paint)
<b>Users / students</b>	Use e-learning system to study and learn tropical forestry and/or community forestry. Read recommended material, solve exercises and communicate with course teacher and others students through online discussion forums and emails	Microsoft Internet Explorer 6.0 Adobe Acrobat Reader

## 4 Lessons learned from experience and student evaluations

This chapter presents and discusses feed-back from the students who participated in Tropical Forestry and Community Forestry and provides an overview of course statistics (no. of hits, when are pages accessed, etc.). Key lessons learned are identified.

### 4.1 Students' critique

This section presents the students' evaluation of Tropical Forestry and Community Forestry. Six (out of 15) students provided comments and suggestions in Tropical Forestry in autumn 2002, and 9 (out of 16) students provided comments and suggestions in Community Forestry in spring 2003. Not all comments from the students can be dealt with here in detail – see appendices 1 and 2 for a complete summary. Note that comments have of course only been obtained from traditional students at KVL – a main target group for the courses are students without access to the KVL campus. These students may have other comments.

#### *Structure of e-learning home pages and individual e-modules*

In general, students are satisfied with the structure of the home page and the individual e-modules (see questions 5 and 6, appendices 1 and 2). It should be noted that both evaluations were conducted prior to some major changes in design in order to make the user-interface more pedagogical. The changes were partly based on these evaluations (e.g. creating a link section to relevant forestry related websites in the Library page). However, students contributed valuable suggestions for improving the structure of e-learning – these are discussed in detail in chapter 5.

#### *The different types of module exercises*

Most students in Tropical Forestry and Community Forestry found the type I exercise satisfactory or necessary, while a few (2 students) emphasised that they were (too) easy (questions 7A, appendices 1 and 2). This type of exercise may not challenge all students as they specifically address definitions, terminologies and concepts in the read materials.

The type II exercise (testing students' understanding of the content of the reading material) receives the same critique as the type I exercises, i.e. students find this type of exercise on average all right, all though some students also find the exercises more difficult, time consuming or hard. One student emphasised that some questions are confusing and unclear (this probably concerns free-text exercises), while other students considered them uninspiring – the reasons may be that this type of exercise has a tendency to focus too much on the content of read materials (questions 7A, appendices 1 and 2). See also students experience in working with e-modules below.

Type III and type IV exercises are in Tropical Forestry generally considered better than the two other types of exercises (questions 7C and 7D, appendix 1) – probably because these exercises allow and challenge students to use theory in real case exercises. In Community Forestry some students, however, emphasised that it is sometimes difficult to understand what the questions are and subsequently what



the answers should contain. It should be noted that students have the possibility to use the discussion page to clarify any uncertainties; however, this option has only rarely been used.

### *Development of e-learning*

In regard to the user friendliness, one student emphasised that multiple choice exercises are not read friendly (question 8A, appendix 2), which suggests that other or larger fonts as option text for each question should be considered. At the moment students can not resize the option text – only the question.

In relation to scientific issues, students highlight that priority should be given to developing exercises and their content and that there is a need to approach course materials from different angles and increase user-interaction (question 8C, appendices 1 and 2). One student even stated that there is no point in reading the materials before commencing the multiple-choice exercises because the answers are available afterwards anyhow (question 8C, appendix 1) – this indicates the need for developing a system that allows students to monitor their own progress and learning.

### *Case study presentations*

Very shortly, students were satisfied with case study presentations – this was especially so in Community Forestry. Case study sessions are probably viewed by students as being a valuable input and inspiring break to reading compulsory literature and doing module exercises. As one student phrased it: *“Use as many cases as possible. They are the spice that makes the legislation texts edible”* (question 9, appendix 2).

### *Students' experience in working with e-modules*

To the question on whether students think that working with e-learning has provided them with a good and thorough understanding of topics the answers are mixed. Positive feed-back derived especially from students in Community Forestry. They think that e-learning has positively helped them by: (i) highlighting and structuring important information and subjects, (ii) motivating/forcing them to read materials and find additional information, (iii) providing them with the opportunity to test their understanding of course subjects through exercises (question 10A, appendix 2). There are, however, also negative criticisms. Though one student see e-learning as good for understanding basic terms the general criticism focus on the lack of teacher-student interactions. This is the case for both Tropical Forestry and Community Forestry (question 10A, appendices 1 and 2). Additionally, one student found the learning aspect missing in the exercises as questions focused too much on what was written in the read materials (question 10A, appendix 1). Other students found the workload of reading the material and doing the exercises too excessive for them to get an overview of the courses (question 10A, appendices 1 and 2).

To the question on whether students think that working with e-learning has improved their learning compared to traditional lectures students emphasise both positive and negative aspects. Those students who think they have learned more using e-learning highlights aspects such as: motivation, challenge, better guidance in the learning process. Many students, however, argue that e-learning can not substitute for traditional lectures, which have comparable advantages such as setting focus on important matters and through discussions helping them to form understandings and opinions about subjects.

Finally, the best and worst about e-learning and suggestions for improvements are listed in table 4 below. Flexibility, case presentations, clear understanding of subjects is mentioned to be the best of e-learning while the lack of student-teacher interaction through lectures is mentioned as one of the worst aspects of e-learning. Constructive suggestions for improvements include, among other issues, the encouragement of reading and discussion groups. Many students, though, emphasise the importance in keeping traditional lectures. Basically, thus, many students argued for mixed model teaching rather than pure distance learning.

**Table 4** Students' comments on the best and worst aspects of e-learning and their suggestions for improvements (Tropical Forestry autumn 2002 and Community Forestry spring 2003)

Best about e-learning		Worst about e-learning		Suggestions for improvements	
Tropical Forestry	Community Forestry	Tropical Forestry	Community Forestry	Tropical Forestry	Community Forestry
-Flexibility	-Flexibility -Case presentations - Clear understanding of subjects -E-learning in general -You can work with it abroad	-No ping-pong -Release dates of modules too late <sup>1</sup> -Lack of student-teacher interface	-E-modules -The lack of student-teacher interaction -Too much reading -More lectures -Release dates of modules too late <sup>1</sup>	-Use e-learning but keep class room sessions -Teachers should correct multiple answers -Course modules available in time	-More lectures, fewer modules - Encourage reading / discussion groups -The e-learning component should be emphasised in course description -Class room sessions after each module to sum up and discuss -Less course material, more lectures to get more time with e-learning -E-modules in time <sup>1</sup>

<sup>1</sup> Release dates were changed during both courses as module development was more time consuming than initially estimated

## 4.2 Course statistics

The following tables and figures present statistics from Tropical Forestry and Community Forestry. Hits, i.e. the number of times students have accessed course and exercise pages during the whole course, are used as a proxy for course activity. Performance data such as number of module exercises completed and correctness of answers given in these exercises would constitute better course evaluating indicators, but exact data is not available due to technical difficulties with Project Net feed-back. Instead, the number of completed module exercises is derived from students' evaluation questionnaires. For Tropical Forestry the data is from September to December 2002 while statistics from Community Forestry are obtained from February to June 2003. 15 participants completed

Tropical Forestry and 16 completed Community Forestry. All participants were enrolled as students at KVL.

### *Tropical Forestry*

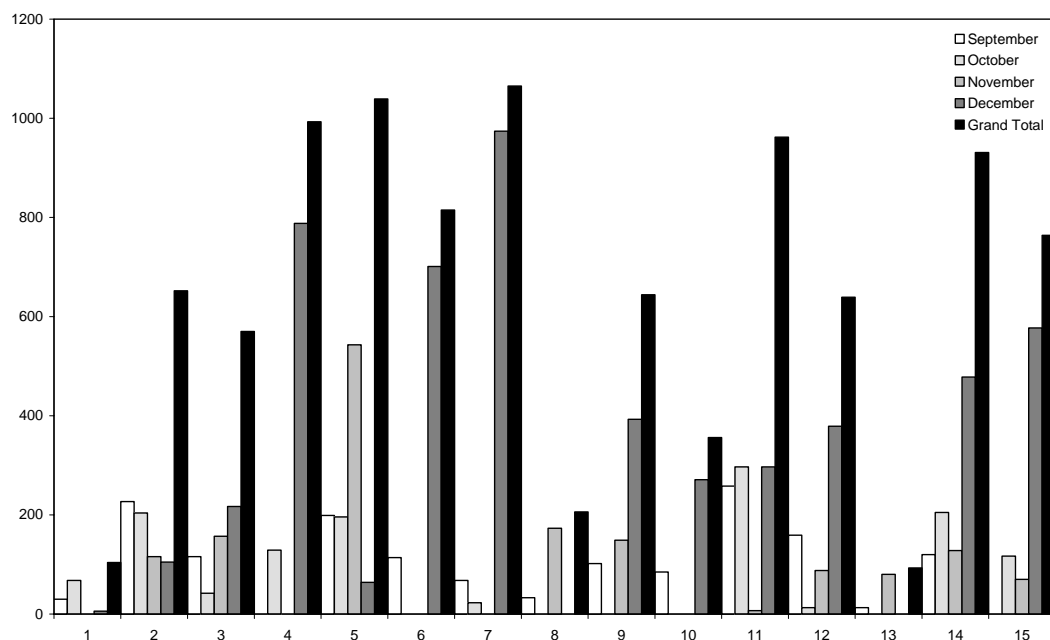
In Tropical Forestry, participants produced a total of 9579 hits. The distribution of hits across months and between students is provided in table 5. The total number of hits per student ranged from 93 to 1065 with an average rate of 656 hits per student. Table 5 also shows the number of hits derived from multiple choice and free text exercises. The number of exercise hits is not equivalent to the number of completed exercise pages (i.e. questions) because other pages not containing questions may be shown to the students during the exercise sessions (e.g. the result pages). However, they still provide a rough picture of students' use of module exercises. The total number of hits derived from exercise pages varies between 26 and 696 hits. If the number of exercise hits is compared with the number of exercise pages, which totals approximately 270 pages, 7 students have more hits than exercise pages while 8 students have less. From these figures it can at least be concluded that more than 50 percent of the students did not complete all exercises. This also corresponds to the figures provided in the evaluation questionnaires where three students completed 8 to 12 modules and two students completed 4 to 7 modules. No student completed all 15 modules (question 3, appendix 1).

**Table 5** Hits on the Tropical Forestry course pages in autumn 2002. Total numbers of hits are distributed across students and months (in absolute numbers and percent)

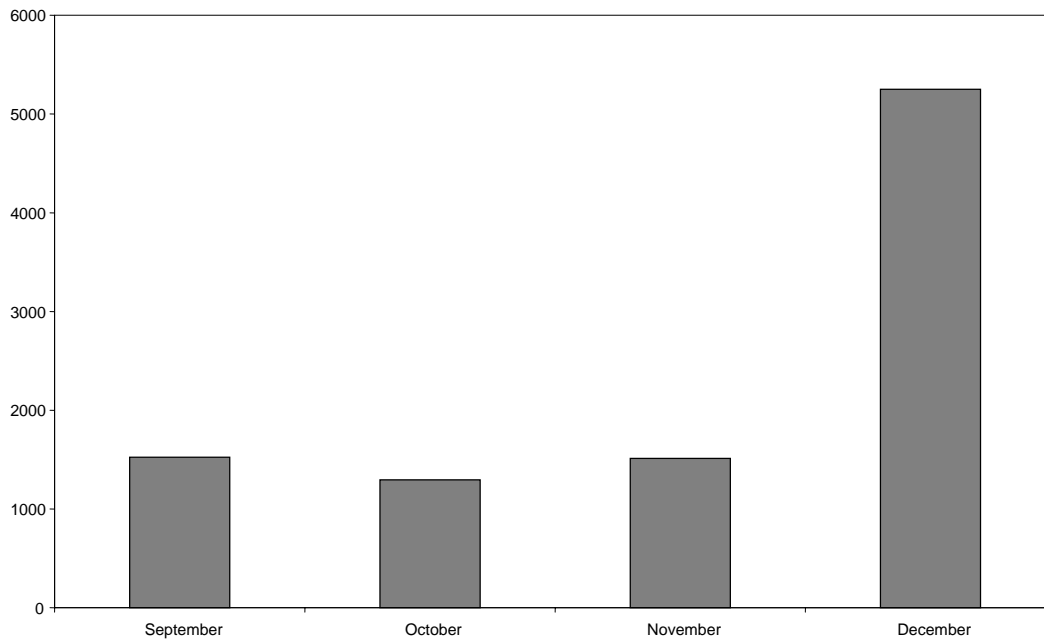
Student	September		October		November		December		Grand Total		Total number of exercise hits <sup>1</sup>	Percent of total number of hits
	Hits	(%)	Hits	(%)	Hits	(%)	Hits	(%)	Hits	(%)		
1	30	28.8	68	65.4	0	0	6	5.8	104	1.1	26	25.0
2	227	34.8	204	31.3	116	17.8	105	16.1	652	6.8	264	40.5
3	116	21.8	42	7.9	157	29.5	217	40.8	532	5.6	362	63.5
4	0	0	129	14.1	0	0	788	85.9	917	9.6	604	60.8
5	199	19.9	196	19.6	543	54.2	64	6.4	1002	10.5	428	41.2
6	114	14.0	0	0	0	0	701	86.0	815	8.5	596	73.1
7	68	6.4	23	2.2	0	0	974	91.5	1065	11.1	692	65.0
8	33	16.0	0	0	173	84.0	0	0	206	2.2	108	52.4
9	102	15.8	0	0	149	23.1	393	61.0	644	6.7	206	32.0
10	85	23.9	0	0	0	0	271	76.1	356	3.7	130	36.5
11	258	30.0	297	34.6	7	0.8	297	34.6	859	9.0	248	25.8
12	159	24.9	13	2.0	88	13.8	379	59.3	639	6.7	364	57.0
13	13	14.0	0	0	80	86.0	0	0	93	1.0	52	55.9
14	120	12.9	205	22.0	128	13.7	478	51.3	931	9.7	648	69.6
15	0	0	117	15.3	70	9.2	577	75.5	764	8.0	528	69.1
<b>Total</b>	1524	15.9	1294	13.5	1511	15.8	5250	54.8	9579	100.0	5256	53.5

<sup>1</sup> Total number of exercise hits refers to the number of question pages (multiple-choice or free text) visited by the student. It is not equivalent to the number of completed questions as other pages during the exercises may be shown to the student (e.g. the result pages).

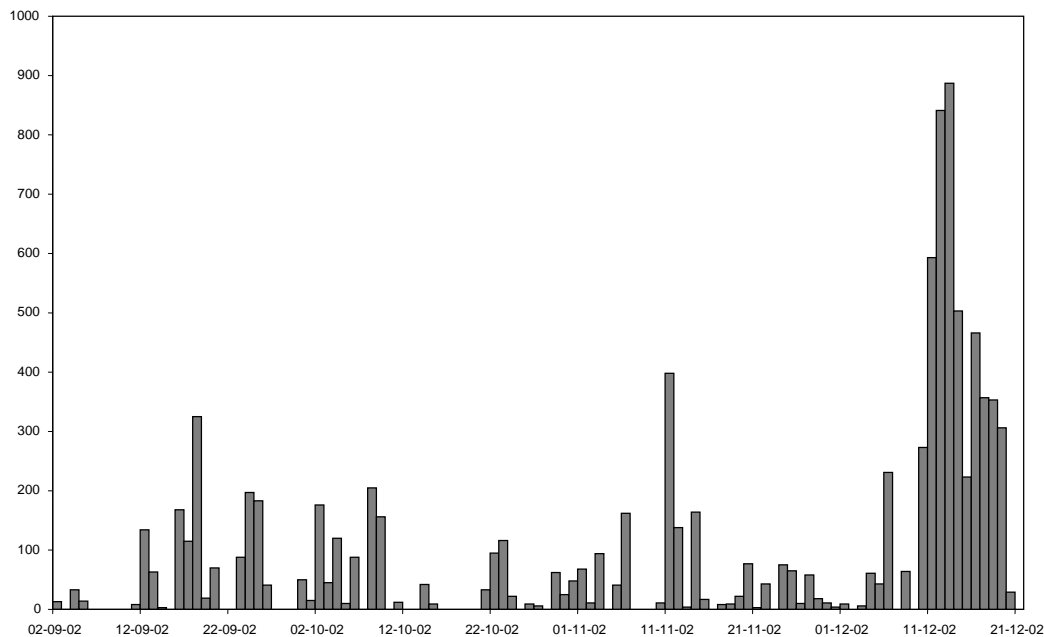
The data reveal, in general, that study activity varies greatly, both in total numbers of hits between students and hits within months for each student (table 5 and figure 14). It is also apparent from table 5 and figures 15 and 16 that study activity is most conspicuous in December (up to the date of examination) - over 50 percent of all total hits are generated in December. And approximately 60 percent of all exercise hits are from December (not shown in table 5). The high incidence of student activity in this month may partly be explained by the circumstance that module exercises once more were made available up to the examinations. Student activity in September, October and November is on an aggregate level more or less the same (table 5 and figures 15 and 16).



**Figure 14** Number of hits per student distributed according to month in Tropical Forestry autumn 2002



**Figure 15** Total number of hits distributed according to month in Tropical Forestry autumn 2003



**Figure 16** Number of hits distributed according to date in Tropical Forestry autumn 2002

### *Community Forestry*

In Community Forestry, a total of 8090 hits were produced – their distribution across months and between students is provided in table 6. The number of hits per student ranges from 0 to 1172 with an average rate of 506 hits per student (one student did not use the web sites at all). Hits on exercise pages varies between 0 and 678 hits, of which 4 students (students 1, 11, 15 and 16) did not or only to a limited extend make use of the exercises (table 6). However, if the number of exercise hits and number of exercise pages (which totals approximately 160 pages) are compared, 11 students have more hits

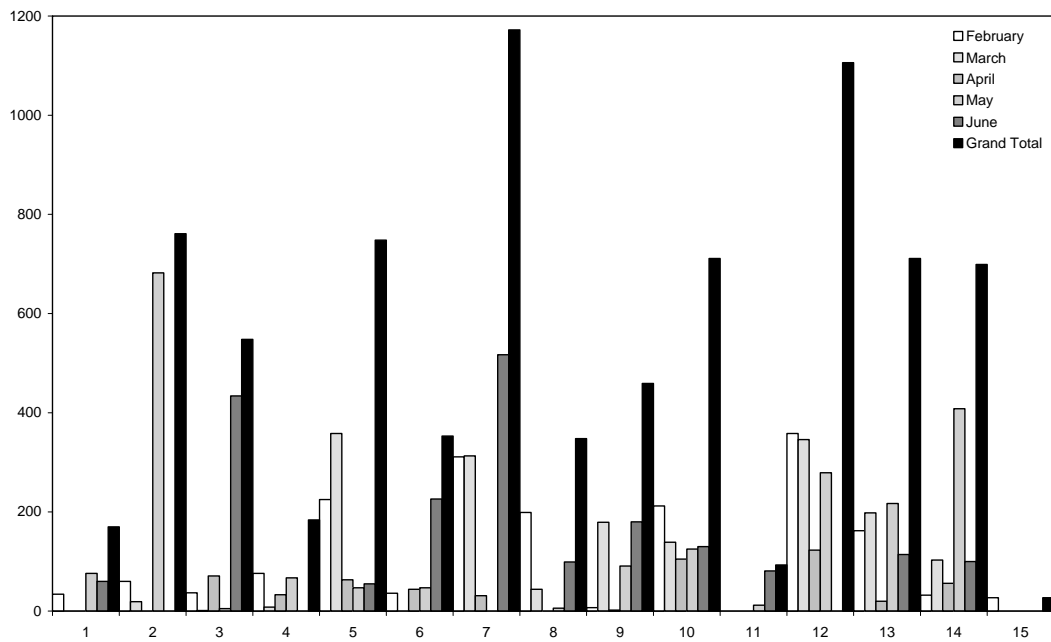
than exercise pages while 5 students have less. Students' use of module exercises is therefore arguably higher compared to Tropical Forestry. These estimates are also supported by the figures in the evaluation questionnaires where one student completed all 13 modules, four students completed 8 to 10 modules, two students completed 5 to 7 modules and, lastly, one student did not complete any exercises (question 3, appendix 2).

**Table 6** Hits on the Community Forestry course pages spring 2003. Total number of hits distributed across students and months (in absolute numbers and percent)

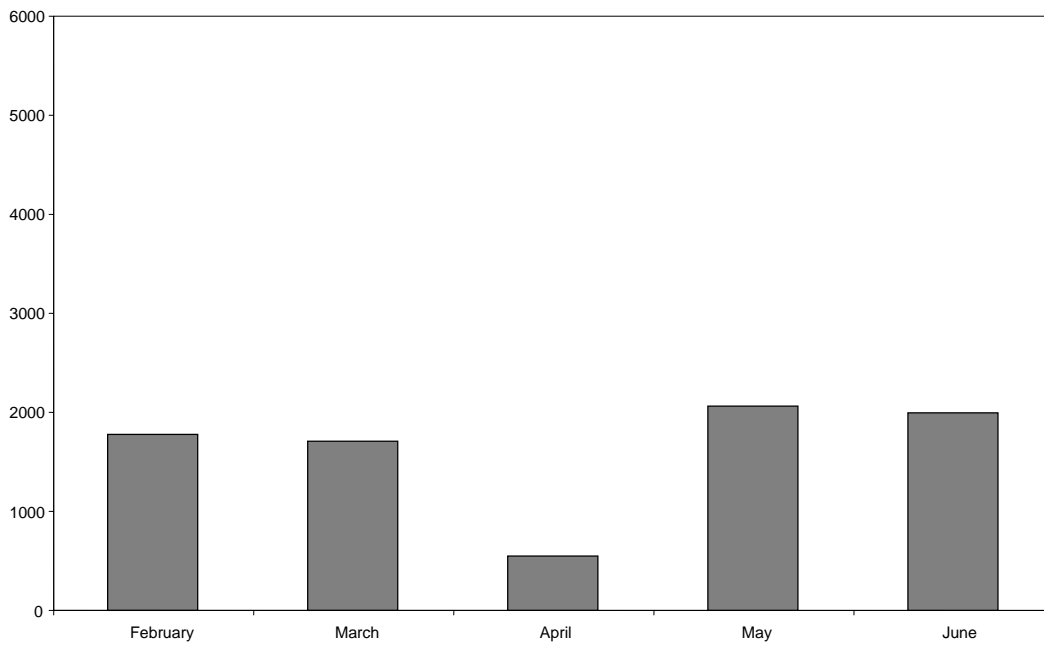
Student	February		March		April		May		June		Grand Total		Total number of exercise hits <sup>1</sup>	Percent of total number of hits
	Hits	(%)	Hits	(%)	Hits	(%)	Hits	(%)	Hits	(%)	Hits	(%)		
1	34	20.0	0	0	0	0	76	44.7	60	35.3	170	2.1	26	15.3
2	60	7.9	19	2.5	0	0	682	89.6	0	0	761	9.4	462	60.7
3	37	6.8	1	0.2	71	13.0	5	0.9	434	79.2	548	6.8	382	69.7
4	76	41.3	8	4.3	33	17.9	67	36.4	0	0	184	2.3	92	50.0
5	225	30.1	358	47.9	63	8.4	47	6.3	55	7.4	748	9.2	258	34.5
6	36	10.2	0	0	44	12.5	47	13.3	226	64.0	353	4.4	250	70.8
7	311	26.5	313	26.7	31	2.6	0	0	517	44.1	1172	14.5	678	57.8
8	199	57.2	44	12.6	0	0	6	1.7	99	28.4	348	4.3	150	43.1
9	7	1.5	179	39.0	2	0.4	91	19.8	180	39.2	459	5.7	310	67.5
10	212	29.8	139	19.5	105	14.8	125	17.6	130	18.3	711	8.8	372	52.3
11	0	0	0	0	0	0	12	12.9	81	87.1	93	1.1	4	4.3
12	358	32.4	346	31.3	123	11.1	279	25.2	0	0	1106	13.7	448	40.5
13	162	22.8	198	27.8	20	2.8	217	30.5	114	16.0	711	8.8	418	58.8
14	32	4.6	103	14.7	56	8.0	408	58.4	100	14.3	699	8.6	450	64.4
15	27	100.0	0	0	0	0	0	0	0	0	27	0.3	0	0.0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
<b>Total</b>	1776	22.0	1708	21.1	548	6.8	2062	25.5	1996	24.7	8090	100.0	4300	53.2

<sup>1</sup> Total number of exercise hits refers to the number of question pages (multiple-choice or free text) visited by the student. It is not equivalent to the number of completed questions as other pages during the exercises may be shown to the student (e.g. the result pages).

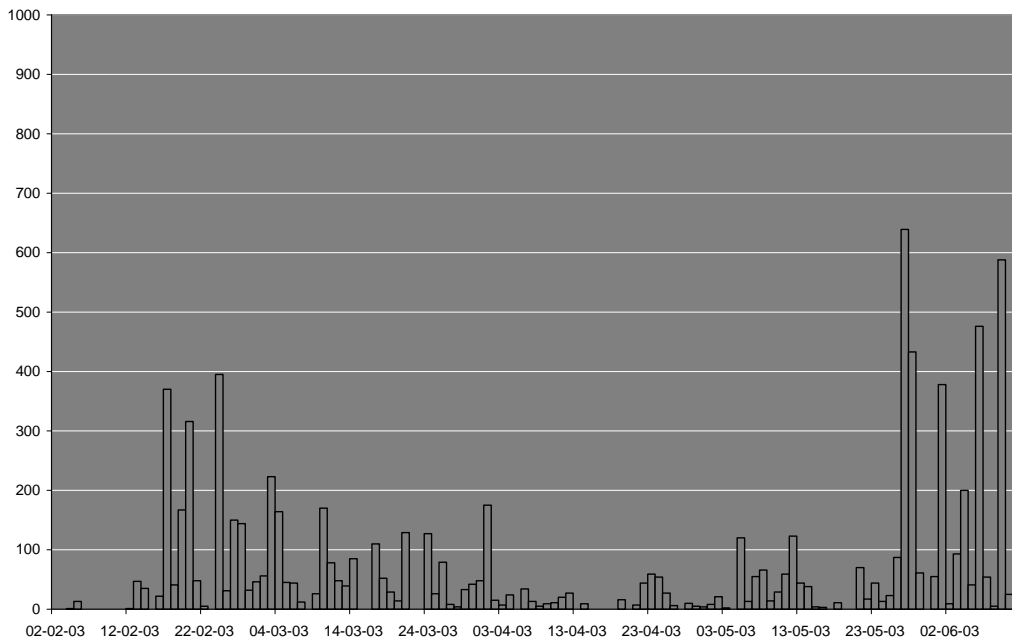
Again, study activity varies greatly between students, but compared to Tropical Forestry the aggregate study activity is more evenly distributed across the months (table 6 and figures 17 and 18) although it (not surprisingly) increases up to the examination in June (figure 19). As in tropical forestry, the module exercises were made available once more up to the examination, which partly explains the high study activity close to the examination. The reason for the low study activity in April was due to students' deadline for submitting the Agricultural Development thematic course report.



**Figure 17** Number of hits per student distributed according to month in Community Forestry.



**Figure 18** Total number of hits distributed according to month in Community Forestry spring 2003



**Figure 19** Number of hits distributed according to date in Community Forestry spring 2003

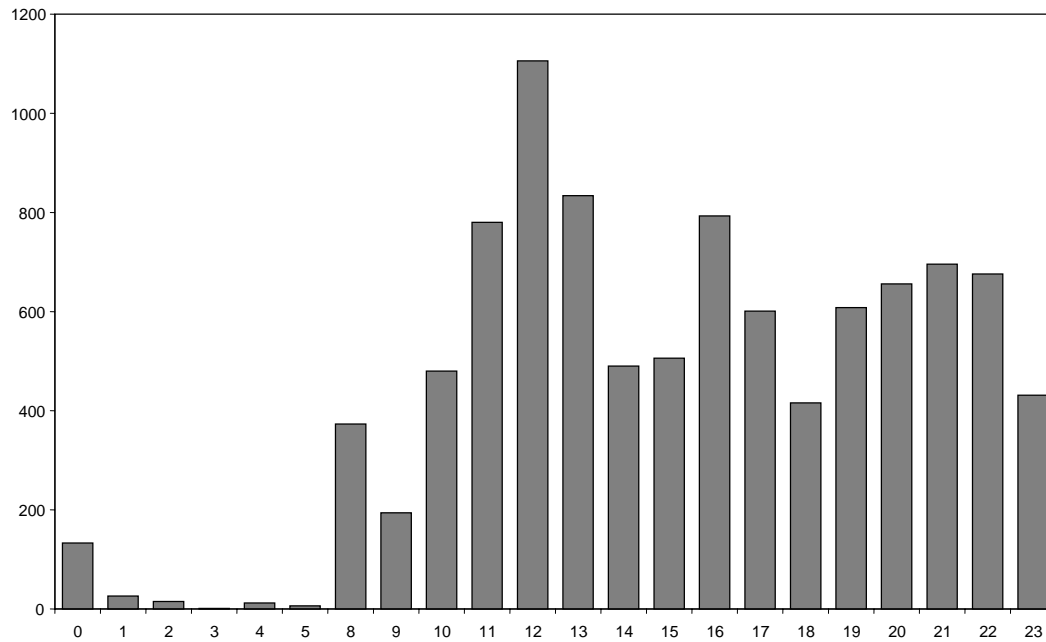
#### *Students' commitment in online discussions*

Only a few students used the discussion forum and ask for help forum to communicate course subjects or to get help: in Tropical Forestry only 17 mails were made public by the students while this was down to four mails in Community Forestry. However, not all communication has been registered. In Tropical Forestry, teacher and students have communicated by e-mail concerning project reports and technical issues and in Community Forestry course participants got individual feedback in a module exercise. This kind of communication is, however, only beneficial for the individual users. There is definitely a need for the teaching staff to pay more attention to how the two forums can be activated.

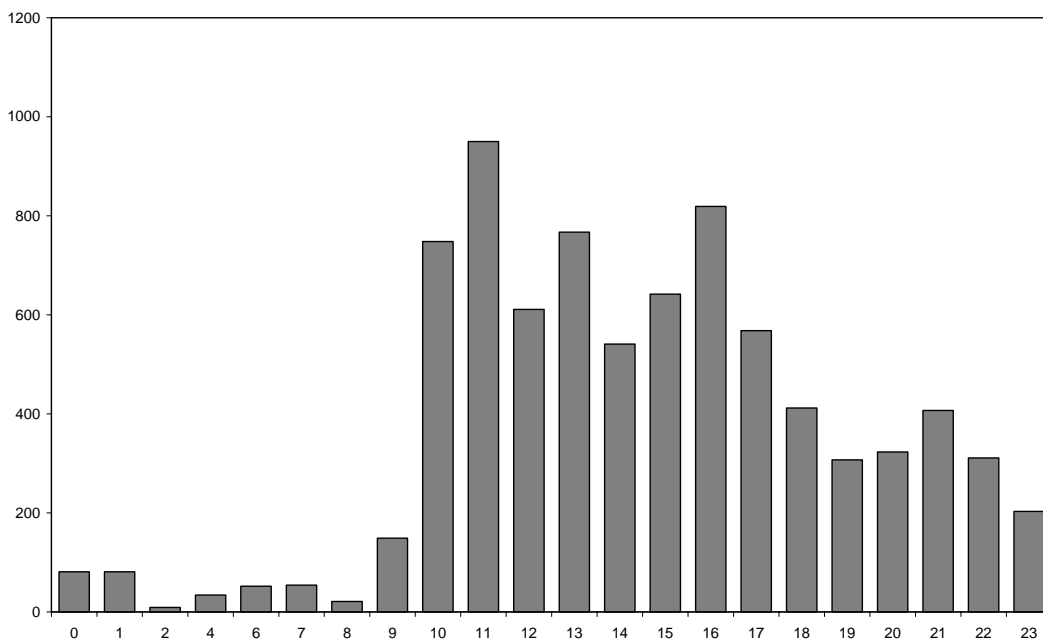
#### *When do students use e-learning*

Figures 20 and 21 show the hours of the day students prefer to work with e-learning in Tropical Forestry and Community Forestry. In general, the students' activity is clustered from morning hours to late evening hours, with a peak around noon (12 pm). The figures reveal that course participants make use of the flexibility that the e-learning system provides.





**Figure 20** Number of hits distributed according to the hour of the day in Tropical Forestry autumn 2002



**Figure 21** Number of hits distributed according to the hour of the day in Community Forestry spring 2003

### 4.3 Experience gained

First, it is important to emphasize the time consuming process of starting up an e-learning project from scratch. Many of the aspects of creating an e-learning product are new to faculties, e.g. web-design, web-administration, writing content to module pages, etc. E-learning is in fact a whole new educational environment which is totally based on texts and electronic communication - as compared to

traditional education that is also build up by physical contact, verbal conversation, body language, etc. This environment is also new to the students and though they have access to a predefined structure of modules, reading materials, exercises, discussion forums, etc., course responsible teachers face a challenge in convincing traditional campus based students of the virtues of e-learning.

The following sections highlight the experiences and views of faculty that have been involved in developing and implementing the present e-learning pilot project, taking into consideration the student feed-back and behaviour presented above. No differences in average final student marks were observed between pure distance learning and previous years' standard class-room teaching.

### **Students' commitment to e-learning**

As seen from the course statistics in section 4.2, many students have so far been reluctant to take part in the e-learning environment (i.e. discussions and module exercises). Students also tend to adhere to an intense short study period up to the examination, perhaps just transferring their behaviour from normal class-room classes. Seen from a learning process perspective this is an undesirable situation as a short intense study period is likely to decrease the amount and quality of learning gained from the courses. There is therefore a need to improve the continuity of the learning process – both in terms of completing module exercises on a continuous basis and on satisfactory terms and in terms of increasing interactions between faculty and students and between students.

It should also be noted that especially pure distance teaching shifts some responsibility from faculty to students: it is no longer possible for students to merely listen to lectures; they have to study compendium material before they can complete exercises. Also, as each student is responsible for her own progress, some students appear to be surprised by the work required to complete the modules. If they start too late in the semester, they may drop out as the growing work load simply seems too large. This again emphasises the need for establishing an active web-community where discussions are frequent and the presence of faculty is continuously felt by students. It also appears necessary to establish mechanisms that increase students' incentives to complete modules and allow them to monitor their own progress (see details in chapter 5).

### **Module exercises**

At present, students can complete both multiple choice and free text exercises without any control measures. For instance, they can simply download all questions and answers without completing any exercises. Furthermore, exercise feed-back relies upon predefined faculty answers that are automatically forwarded to students. The present approach does not appear to promote work with exercises. It would probably be more student learning productive to require exercises to be completed while providing students with the opportunity to monitor their own progress. At the same time faculty feed-back should be increased, especially in relation to free text exercises, and student-to-student discussions encouraged.

Developing good exercises is of course time consuming and difficult. Below is a list of experiences that may be useful to keep in mind in future development of e-learning exercises:

- i. It is not possible to cover all subjects within a module. Select only the most important issues.
- ii. Include no more than 10 questions in a multiple choice exercise and no more than 4 to 5 questions in a free text exercise.

- iii. Multiple choice exercises are suitable for basic concepts and definitions, but becomes increasingly difficult to make as subjects become more complex. At some point it is more suitable to use free text exercises. Multiple choices are normally used to test the breadth of knowledge while free text answers are used to test the depth of knowledge.
- iv. In order to challenge the students when using multiple choice exercises, these are usually prepared with several correct answers.
- v. Multiple choice correct options are easy to make whereas incorrect options may be difficult and time consuming to produce as they should appear plausible. The level of complexity in multiple choice exercises can be very high.
- vi. Trick questions are not pedagogical and should be avoided.
- vii. Avoid too many options in multiple choice questions (e.g. no more than 8 options) and long sentences.
- viii. Make variations in each exercise, e.g. by shifting from true/false questions to questions with multiple options and by including pictures, tables, and figures.
- ix. Avoid “learning by heart” questions but approach course subjects from different (innovative) angles (easier said than done).
- x. Automatic feed-back may be appropriate for multiple choice exercises and a number of free text exercises. But there should always be some degree of individual direct faculty feed-back.

#### **4.3.1 Page structure and layout**

Designing the various pages and contents involves many decisions about the formats of hypertext (webpage text with links), photographs and illustrations (graphs, tables, icons, etc.). As a functioning web site contains a great number of pages and other elements, indicating that implementing common changes across one element type is time consuming and costly, such decisions should be taken as early in the development process as possible.

A standard format for all the different categories of web pages should thus be decided upon. In order to illustrate the character of such decisions and the level of detail needed, appendix 3 summarize some of the pedagogical decision variables to consider when producing hypertext. In addition, basic considerations concerning implementation of a read-friendly screen layout and building of a more logical website structure are provided below:

- i. Page design and structure should be the same in each module page so students easily become familiar with the website.
- ii. Provide continue buttons or arrows that guide students through the pages.
- iii. Main links (e.g. to core pages) should be available on all pages and links should be placed in the same column (e.g. left frame).
- iv. Links should have names that clearly explain their use.
- v. Generally, the number of fonts used on each page should count no more than two to four different types. In the tropical forestry courses, only two types are used, i.e. Arial and Verdana.
- vi. Keep text short (where possible), so students do not have to scroll down to read, and make it inspiring by e.g. including a quotation.

- vii. Facilitate reading by including an initial in the start of the text - the probability that students read the text will be higher. As a rule of thumb, use a maximum of one initial on each page or save them for special pages only, e.g. the module introduction page (see appendix 3).

These considerations have guided the implementation of a new design in both courses, after the first version of the e-learning system was completed. The tables in Appendix 4 illustrate this work by comparing the core pages and module pages, respectively, from the website of Community Forestry in spring 2003 with those from the website of the Tropical Forestry course in autumn 2003.

## 5 Suggestions for improvement of e-learning

This chapter synthesises the findings and observations in the previous chapters and presents recommendations for developing e-learning at (i) the university level, (ii) the department level, and (iii) the individual course level.

### 5.1 At university level

KVL should develop an e-learning strategy. The university should move from only supporting decentralised local initiatives to developing a coherent strategy. The e-learning strategy should specify the role of e-learning in future teaching as well as the modalities for increasing e-learning at KVL. Key questions to address include:

- (i) How can e-learning be used strategically to improve the quality of teaching, e.g. through development of joint degrees
- (ii) How can e-learning be used to enter new markets such as continuous education and international students
- (iii) How should e-learning be integrated in teaching, e.g. what should be the distribution between mixed models and pure distance teaching; how should courses be developed; what technical help is required
- (iv) How should quality assurance and evaluation of e-learning take place
- (v) Development of a realistic time plan and activity schedule to implement the strategy
- (vi) What management changes are required to successfully implement the strategy, e.g. is a KVL E-learning Manager and more technical staff necessary
- (vii) The costs should be assessed and funding made available for the necessary investments. How can economies of scale be realised
- (viii) The need for training of faculty and staff should be assessed and funds made available for any necessary training
- (ix) E-learning should ideally be integrated with existing e-administration and tools (CampusNet), the best software for this needs to be identified and obtained
- (x) Evaluation of e-learning performance at the department level should be included in the biennial budgets. Evaluation of e-learning performance at the individual level should be included in local salary discussions.

If KVL decides to develop a comprehensive e-strategy, e-learning should be part of this strategy.

Increased use of e-learning would require that faculty obtains new skills. Building on the current positive tendency at KVL to focus more on teaching, Education Reform 2005 could be followed by workshops for faculty focusing on how future teaching should be conducted at KVL and what this requires, e.g. in terms of new pedagogical approaches. The switch to problem-based learning could be continued and strengthened by integrating e-learning into teaching; there seems to be potential for e-learning in almost all KVL courses through mixed modes of teaching.

## 5.2 At department level

The departments hold the main key to ensure successful adoption of e-learning. As for the university, each department should develop a brief e-learning strategy. Different departments have different teaching commitments and courses and strategies can therefore be expected to vary considerably.

### 5.2.1 The example of the Danish Centre for Forest, Landscape and Planning

S&L has substantial teaching activities from the ranger level to PhDs. This includes involvement in programmes with a very international profile, such as the tropical forestry profile of the MSc in Agricultural Development programme, continuing education as well as a large number of standard KVL courses. Thus, from both the viewpoint of improving quality of existing courses and accessing new markets, e-learning appears to hold substantial potential. The following outlines the main steps that S&L could follow in order to benefit from e-learning:

- i. As for KVL above, S&L should develop a brief e-learning strategy. This should represent a structured and coherent approach to actively using e-learning to improve quality of teaching and reaching new markets.
- ii. S&L should decide what educational programmes should be prioritised for e-learning development. This should be connected to plans in the educational strategy for accessing international students and developing joint degrees with other universities.
- iii. S&L should push KVL for development of an institutional e-learning strategy that can reinforce the department's strategy as well as provide a platform for obtaining national and international funding for developing the S&L e-learning initiative.
- iv. S&L should decide, preferably in collaboration with KVL, what format to use for e-learning courses. This includes choice of software, need for technical staff and backup, training of faculty, etc.
- v. S&L should design, preferably in collaboration with KVL, a monitoring and evaluation system for e-learning activities.
- vi. S&L should decide on incentives to motivate faculty to become involved in development and implementation of e-learning activities.
- vii. S&L should develop a 3-5 year implementation plan for the strategy, including details at course level. This should be based on a realistic assessment of costs and available funding.
- viii. S&L should develop experience sharing mechanism for faculty involved in development and implementation of e-learning activities.

## 5.3 At individual course level

In the following are presented suggestions to improve e-learning in Tropical Forestry and Community Forestry. Recommendations are based on the experiences outlined previously in the report. (Thus this is not a guide to how to develop e-learning from scratch in new courses).

### 5.3.1 Pedagogical improvements

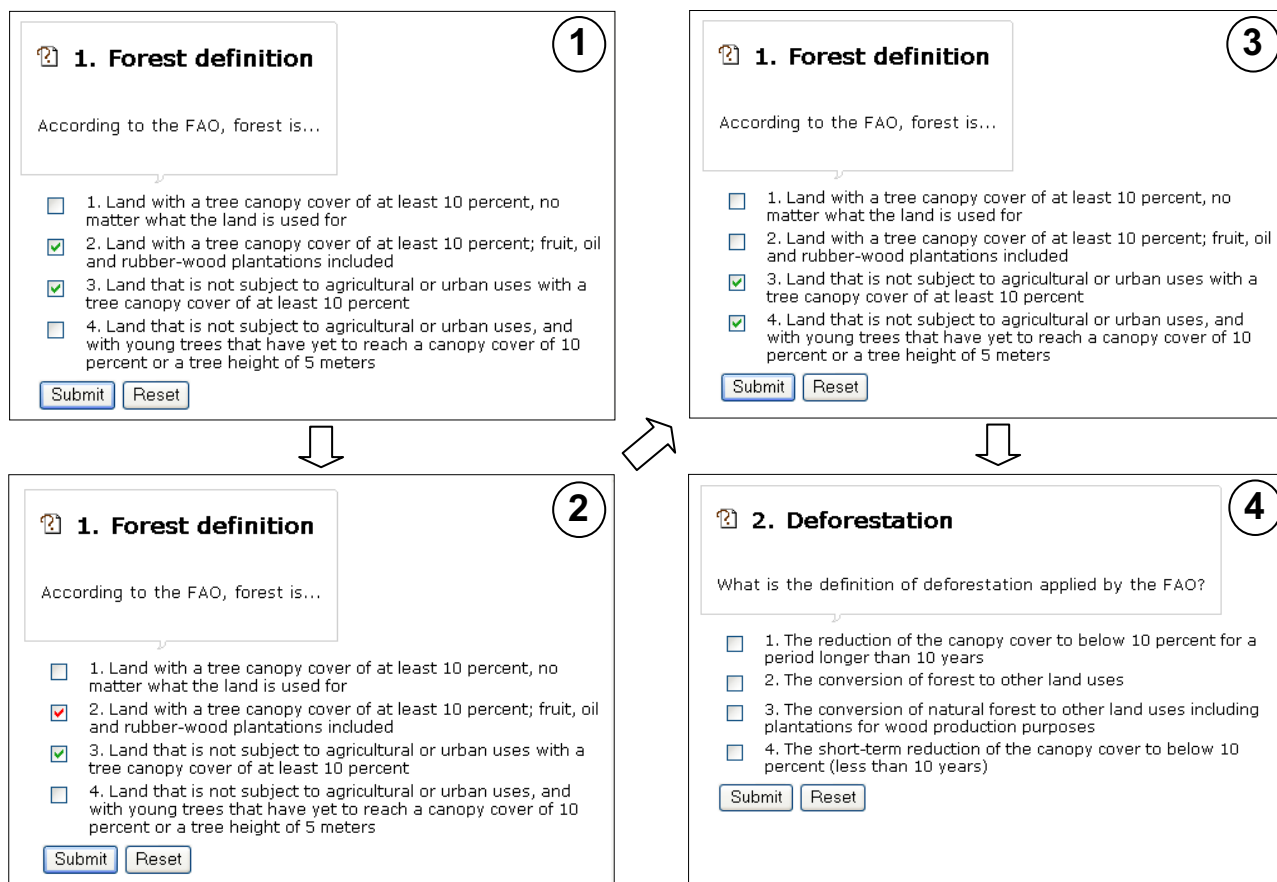
*Mechanism to increase students' commitments to module exercises*

To improve the conditions for learning, the students should not have the opportunity to simply scroll through all questions and answers. If students can not answer questions, they should be made to reflect upon the issue. This could be done by making the system automatically check whether the student has

passed a particular multiple choice exercise based on a predefined criterion - e.g. whether the student has answered 50 percent of the questions correct. If not, the student should be presented with the questions that failed to meet the scoring standard and be allowed to answer them again.

There are several ways in which this could be implemented. One way is presented in figure 22 below. Here the answers of the student are evaluated after each question. If the student fails to answer the question correctly (i.e. does not receive a score above 50%) she is guided back to the same question where correct answers are marked by green tick markers and red markers indicate wrong answers. This is but one proposal to the check-up system. Alternatively, the students could be evaluated after each exercise (group of questions). In this case, the student would fail to have completed the exercise if the average score for all questions is below, e.g., 50 percent. The student would then have to redo the questions that were not passed.

In free text exercises, technical solutions are difficult to develop to increase students' efforts to complete these exercises. At present, when students submit their free text answers they receive a predefined possible answer. Though some students may find it motivating to see whether their own answers correspond to the possible answer provided at the end of the exercise, other students may not be motivated to put effort into answering the free text question – simply because their answer is not evaluated by anyone and because a predefined answer is revealed to them anyhow. One student suggested that free text exercises should receive individual evaluation by the teacher. This is not a feasible solution as teachers can not possibly provide individual feedback to all students regarding all free text exercises - there are simply too many of them. There is a need to consider other ways to increase students' involvement in free text exercises, e.g. (i) by making students evaluating each others answers, or (ii) facilitate on-line group discussions of answers. Another idea could be to provide predefined answers to type III exercises while providing personal feed-back to type IV exercises (the most challenging exercises). It should also be considered to introduce a written assignment, similar to a type IV exercise but spanning several modules, that must be submitted to the teachers before gaining access to the examination. Students would then receive personal feed-back to this assignment.



**Figure 22** Example of how the scoring checkpoint system could be designed. 1) The student decides that options 3 and 4 are correct. 2) The student does not proceed to question 2 because the total score of question 1 is 0 percent (one correct = 50% and one wrong = -50%). Thus, question 1 reappears. To help the student, the option which is not correct is marked with a red tick mark (option 2) while the correct option 3 is marked with a green tick. 3) The student decides that option 4 must also be the correct answer. 4) The student proceeds to question 2 as the score is above 50 percent in question 1 (in this case two correct answers = 100%).

### *Learning management system for delivering instruction and tracking learner results*

As chapter 4 revealed, there is a need to improve teaching and students' commitment. Ways to achieve this are outlined below:

(i) **Personalisation.** The e-learning site should be more personal in order to increase the individual student's sense of ownership and belonging; this could be useful in improving communication between students and between teachers and students. This may be achieved by creating a folder where information and photos of course participants and teachers is accessible to all who is enrolled in the e-learning course. Furthermore, each participant should have the option of adding personal information, links, notes on subjects of particular interest, etc.

(ii) **Establish an active web community.** Teachers need to spend more time on initiating and cultivating (synchronous and asynchronous) discussions. This could be done by (a) posting a key scientific question on the discussion list on a weekly basis (related to the module that students should be working on in that particular week); (b) make each student responsible for



asking questions to a particular module and for answering questions in another module; and (c) facilitate discussions of exercises.


(iii) Benchmarking individual student achievement and progress through the use of a portfolio folder. The portfolio folder is a pedagogical tool aimed at facilitating a continuous learning process that will allow students to monitor their own progress during the course, e.g. allowing them to find out if they improve. This implies that students should be able to receive a score against which to measure their progress (e.g. scores from exercises, contributions to discussions and teacher evaluations). The portfolios would also make it possible for teachers to get a general idea of the level of the whole group of students as well as the individual students. This would for instance allow teachers to focus on supporting and motivating weaker students.

An electronic portfolio folder could consist of:

- a. Study plan, on-line appointments with teacher, deadlines for module exercises and project report submissions
- b. Scientific e-learning materials
- c. A discussion forum (is already included in the e-learning courses, but could instead be located in the portfolio folder)
- d. Log-books that contain correspondence with teacher and other students
- e. Completed exercises with scores and exercises not completed
- f. Examples of examination questions and answers

#### *Design of results in multiple choice exercises*

Regarding the multiple choice exercises, one student suggested a “standard” answer or explanation to each question. At the moment, students can only see whether the options they have chosen are correct or not, i.e. they are not provided with a short explanatory text. Introducing brief explanations could help clarifying uncertainties related to the multiple choice questions. In addition, the score for each question could be highlighted in the upper left corner of the table as a supplement to the tick marks in the fourth row (figure 23).

Percent correct: <b>100 %</b>	10. Methodology Which of the following methodologies used in the FRA assessment in 1990 were excluded from the FRA assessment in 2000?				
	1. A generalised deforestation model to project forest cover to reference years	2. Remote sensing survey in tropical areas	3. Country level data inventory	4. Expert opinion approach	5. The use of land cover classes to assess the extents of and changes in natural forest types and non-forest types in tropical regions
Status	+	+	+	+	+
Jørgen Jørgensen					
Explanation: The use of a generalised deforestation model in the 1990 Assessment to accommodate poor data quality proved to be an oversimplified method to project forest cover to the reference years. It was therefore heavily criticised. Instead, the expert opinion approach was adopted as it was seen as a reasonable approach to arrive at country level estimates.					

**Figure 23** Example of a new revised result table provided to the student after the completion of an exercise

### *Literature and other materials*

Compendium material in both the Tropical Forestry and Community Forestry courses consist almost exclusively of scientific articles and book chapters. In order to produce a more animated and interesting learning experience, it may be an idea to increase the use of other types of material on an experimental basis: for example statistical raw data, newspaper and magazine articles, audio and video, etc. Professionals talk about such an integration of multiple media as rich media. However, before work can commence on making enriched compendium material available on-line, legal issues have to be settled (section 2.4.3).

### *Remediation*

The lack of remediation is a problem with the tropical forestry website. How can students encountering problems be helped to progress in an appropriate way without having to write emails and wait hours for others to answer? A solution is to include a frequently asked questions (FAQ) page with solutions to encountered or anticipated problems. Alternatively, a help function based on a character like the Office Assistant in Microsoft Word could be developed.

### *Structure of e-learning home pages and individual e-modules*

Students have provided suggestions for improvement:

- The text boxes in exercises should be larger/wider so entering essays become easier
- In the login page, the curser should automatically be positioned in the user name box
- Ease navigation between modules by providing a dropdown list on the left hand bar
- The option text in the exercises is not user-friendly. Students are only able to resize the question – not the options. A different size or format should thus be considered.

### 5.3.2 Required software development

#### *Project Net documentation*

There is no available documentation of system specifications or a user manual. Writing these would be useful to administrators and must be considered a prerequisite for any further adoption of Project Net by KVL or other institutions.

#### *The multiple choice statistics*

The layout properties of the multiple choice statistics should be more conveniently arranged for the administrator to do statistical analysis. Presently, it is quite cumbersome as data has to be copied from Internet Explore to an Excel spreadsheet, i.e. the administrator has to rearrange data before it is possible to perform statistical analyses, e.g. using pivot tables. Tables 7 and 8 below provides examples of how data could be displayed in the “multiple choice advanced statistics” according to students and module exercises. Alternatively, the data could be generated through the making of standard master queries in the SQL database. The system developer could then send data to the administrator on request.

**Table 7** Suggested format for multiple choice statistics arranged according to module exercise

User ID	Name	Module exercise	Question Number	Score	Average score of module exercise <sup>1</sup>
423	Jens Hansen	CF project management: Exercise 1	1	25	56
441	Kasper Larsen	CF project management: Exercise 1	1	75	56
447	Søren Juul	CF project management: Exercise 1	1	100	56
460	Maria Dissing	CF project management: Exercise 1	1	75	56
423	Jens Hansen	CF project management: Exercise 1	2	50	56
441	Kasper Larsen	CF project management: Exercise 1	2	33	56
447	Søren Juul	CF project management: Exercise 1	2	65	56
460	Maria Dissing	CF project management: Exercise 1	2	25	56

<sup>1</sup> Average score refers to the average module exercise score (all student scores included)

**Table 8** Suggested format for multiple choice statistics arranged according to students

User ID	Name	Module exercise	Question Number	Score	Average score of module exercise <sup>1</sup>
423	Jens Hansen	CF project management: Exercise 1	1	60	63
423	Jens Hansen	CF project management: Exercise 1	2	35	63
423	Jens Hansen	CF project management: Exercise 1	3	100	63
423	Jens Hansen	CF project management: Exercise 1	4	100	63
423	Jens Hansen	CF project management: Exercise 1	5	20	63
423	Jens Hansen	CF project management: Exercise 1	6	50	63
423	Jens Hansen	CF project management: Exercise 1	7	67	63
423	Jens Hansen	CF project management: Exercise 1	8	75	63

<sup>1</sup> Average score refers to the average student score in that module exercise

#### *The multiple choice advanced statistics*

At the moment, there may be a flaw in the function “multiple choice advanced statistics” (available to the administrator to retrieve data on students’ achievements in the module exercises). The potential

error was discovered by comparing the number of hits on exercise pages with the number of exercises completed by the students. Some students had visited exercise pages over 400 times, but the multiple choice statistics showed no completion of any exercise. This should be immediately investigated as the multiple choice statistics will be crucial in future evaluations of exercise performance (both individual student performance and to assess if individual exercises are too difficult or too easy).

#### *Multiple choice administration*

When accessing the multiple choice administration, the “Select questionnaire” drop down menu is not arranged in any particular order. This becomes increasingly frustrating and time consuming as the number of courses and exercises increases. The list should be sorted alphabetically according to course.

#### *Auto numbering*

Auto numbering of the options in each question would ease the work of the administrator. At the moment, numbers are manually written into each option – and thus, frustratingly, have to be manually changed when exercises are revised.

#### *Automatic updates of assigning scoring weights*

The negative scoring weights in each question should automatically be updated when pressing the “Equal weight” button in the multiple choice administration. At the moment, only positive scoring weights (i.e. correct answers) are automatically assigned a value. Additionally, the administrator has to upload the multiple choice exercise each time the scoring weights are saved, which is time consuming. It would save working time if an exercise was automatically uploaded after saving scoring weights.

#### *Standard course and module folders*

Currently, each course and module folder has to be constructed from scratch in the page builder. That is, every course and module page, links, and subfolders have to be added to the course and module folders before the structure is in place and before the administrator can begin to add contents to the course and module pages. This is a time consuming task that is further made difficult as changes in the configuration are only visible after the page builder site is reloaded (see below). A standard course folder with standard module folders should be developed. Standard module folders should contain predefined standard module pages (introduction, overview, read and exercise pages), standard links (ask for help, discuss, library, exit), and standard subfolders (read and exercise). The module pages could, in addition, contain predefined hyper text configurations and structures (e.g. invisible tables, text fonts, text sizes, uploaded images, etc.). The administrator would then only need to make small adjustments where needed.

#### *Page builder*

Making the page builder more user friendly is needed. The movement and rearrangements of folders, web pages, links and subfolders in the page builder is cumbersome. For instance, moving a folder is time consuming as the page builder is uploaded after each movement – and you are only allowed to move one level at a time.

#### *System cleanout*

At the moment, it is not possible for administrators to completely remove old users from the user database. This makes (i) the security overview of users unnecessarily long and thus more time consuming to use, and (ii) makes old users answers to exercises appear on multiple choice statistics. It

should be possible for administrators to completely delete users (rather than just deactivating them) from their courses.

#### *Exercises*

Editing individual exercises could be improved by making it possible to change between multi and single answer types.

#### *Options under individual exercises*

Editing of options could be improved by making it possible to change options from correct to not correct. It should also be possible to switch from free text to option.

#### *Exercise titles*

Some module titles are too long for the system. The ideal solution would be that the whole name is displayed rather than an axed short version (e.g. “Danish development assistance and...: Exercise 1” is shown in place of “Danish development assistance and forestry in developing countries: Exercise 1”).

Module titles should always refer to a specific title and avoid reference to a particular course (e.g. “Danish development assistance and forestry in developing countries: Exercise 1” instead of “TF Module 09: Exercise 1”). This will ease use of modules across courses.

## **5.4 The Valley Project**

The authors have been discussing and drawing up an entirely different approach to e-learning in tropical forestry; this initiative is called the Valley Project. The basic idea is to turn the teaching process around to enhance learning: instead of starting, as does both courses (and probably almost all courses at KVL), with presenting theory and then exposing students to gradually more challenging tasks corresponding more and more to complex situations in reality, the approach is to let students start by encountering real life situations, e.g. deforestation on a steep hill slope, and working with related questions. Only then is the relevant science introduced and students will then re-work their way through the already known case using the just introduced theory.

In order to avoid repetitions and benefit from general background factors (such as information on historical land use patterns, local political set-up, climate data, prevailing legislation, etc.) all cases are set to take place in the same fictive valley in a developing country. The Valley, with all the general background information, can then be used across virtually all courses whether dealing with soil fertility management or development economics.

However, turning teaching around as outlined would be a major task. Due to the time demanded, the Valley Project is on the drawing board only and will not be pursued until more information on the future of e-learning at KVL and S&L is available.

## 6 Conclusions

E-learning represents an opportunity to increase the quality of teaching at universities while simultaneously gaining access to new markets. Teaching quality can be improved by eliminating low quality class-room lectures, by integrating the best of face-to-face teaching and distance learning in mixed modes of teaching, and by new use of technology, such as electronic commented rich versions of compendium material. Teaching quality is also likely to be improved if e-learning leads to more transparency on the international market for university education, and as pure distance e-learning allows universities to establish joint degrees at reasonable costs to students. Pure distance courses can also be used in capacity building to enhance the quality of teaching at partner institutions in the developing world. In the longer term, e-learning may even have potential to lead to a better balance between research and teaching at universities.

This pilot project on establishing web-based teaching in tropical forestry has demonstrated that it is economically and technically feasible to establish pure distance courses at KVL today. Cost to establish a pure distance course from scratch, using the developed Project Net software, is estimated at 900 hours. This is a high estimate: it seems reasonable to expect lower costs for courses with already developed exercise material and courses adopting mixed models of teaching rather than pure distance teaching. Technically, it is now possible to deliver the developed courses (in Tropical Forestry and Community Forestry) anywhere in the world where there is access to the internet. However, there is still scope for improving the quality of the developed courses. It seems especially important to focus on pedagogical issues in order to increase students' sense of belonging to an active study and research community. Solutions include more on-line teacher-student interaction and feed-back as well as establishing portfolio folders that allow students to monitor their own progress during a course. Many of these solutions require further development of the used Project Net software.

There seems to be potential for e-learning in almost all courses at all departments, e.g. through mixed modes of teaching. However, in order to fully gain from e-learning, it is emphasised that both KVL and individual departments need to carefully consider and explicitly formulate their e-learning strategies. Issues to be considered at the university and department levels have been briefly outlined. By adopting a proactive approach to e-learning, KVL and selected departments may be able to be among the first agricultural universities and departments to realise the potential of e-learning.

## 7 Appendix 1: Course evaluation for Tropical Forestry (autumn 2002)

**Table A1** Evaluation questionnaire containing the answers of six students in Tropical Forestry

	Agricultural Development	Forestry	Other
1. What MSc programme do you expect to complete	3	2	1

	Very Low	Relative y Low	Average	Relative y High	Very High
2. How did you prioritize Tropical Forestry			2	3	1

	0	1 to 3	4 to 7	8 to 12	13 to 15
3. Please indicate the number of completed e-modules			2	3	

	1 to 3	4 to 6	7 to 9	10 to 12	13+
4. Time to complete an e-module (including reading material and doing exercises)	1	4	1		

5. Please indicate your opinion on the <i>structure of the e-learning home-page</i>	1	2	3	4	5	Comments
A. Login and password	1	3	1			The curser should be in the login box
B. Guide to get started	3	1	1			Did not use it
C. Guide to completing exercises	4	2				
D. Links		3			1	The links are bad, especially with the KVL and the FLEC web-pages. The connections should be improved.
E. Course welcome page	4	2				
F. Module overview page	3	3				
G. Discussion list	1	2	1			One student was not aware of the discussion list

1 = very good and 5 = lousy

6. Please indicate your opinion on the <i>structure of the individual e-modules</i>	1	2	3	4	5	Comments
A. Introduction page	3	3				All pages should have been there faster
B. Overview page	1	4	1			Should be more elaborated since there is no lectures
C. Lessons learned page	1	1	3			
D. Read page	2	3				
E. Exercise page	2	3		1		There have sometimes been problems with “permissions” when the answers was filed

1 = very good and 5 = lousy

7. Please provide your opinion on the contents of the exercise (e.g. necessary? too easy or difficult?)	Comments
A. Type I (testing knowledge of terminology)	<ul style="list-style-type: none"> <li>• In average OK. Some easy, some difficult</li> <li>• Okay</li> <li>• Too easy. You can complete it by only looking at the figures in the text.</li> <li>• Necessary, easy</li> <li>• In general the structure and content in the exercises is good enough</li> </ul>
B. Type II (testing knowledge of literature contents)	<ul style="list-style-type: none"> <li>• In average OK. Some easy, some difficult</li> <li>• Okay</li> <li>• Too easy. You can complete it by only looking at the figures in the text.</li> <li>• Boring</li> <li>• In general the structure and content in the exercises is good enough</li> </ul>
C. Type III (easy case)	<ul style="list-style-type: none"> <li>• Okay</li> <li>• Better than Type I &amp; II. Now you have to use your brain</li> <li>• Good</li> <li>• Not suitable for e-learning</li> <li>• In general the structure and content in the exercises is good enough</li> </ul>
D. Type IV (difficult case)	<ul style="list-style-type: none"> <li>• Okay</li> <li>• Better than Type I &amp; II. Now you have to use your brain</li> <li>• Very good</li> <li>• Not suitable for e-learning</li> <li>• In general the structure and content in the exercises is good enough</li> </ul>



8. Please provide your opinion on what should be prioritized in the development of e-learning and why?	Comments
A. User friendliness (e.g. more user interaction or better design of pages)	<ul style="list-style-type: none"> <li>• There was some difficulties to figure out how to get from module to exercises</li> <li>• Okay</li> <li>• Okay</li> <li>• It is already OK</li> <li>• Could be improved</li> </ul>
B. Technical issues (e.g. different links or software)	<ul style="list-style-type: none"> <li>• It was all right</li> <li>• The link margin should be the same place. Now you have to click in the upper bar, then in the left, then back in the upper bar...It should all be located in the left column, as in most software (e.g. internet explorer etc.)</li> <li>• Not really</li> <li>•</li> </ul>
C. Scientific (e.g. different types of exercises)	<ul style="list-style-type: none"> <li>• Well, I think or assume that in different countries there is different ways to sent messages: lectures to students; what's important. Danish-KVL way might be difficult for some foreigners especially from developing countries. I know it is not possible to cover all the aspects, but maybe something could be done.</li> <li>• Multiple Choice is OK, but try to come up with something different. As long as the results are available afterwards, you can do anything.</li> <li>• Try to use e-learning as a learning tool, by approaching the subjects from a different angle. A multiple choice on whether or not you read is irrelevant.</li> </ul>

9. Please provide your opinion on the use of case presentations	Comments
Do case presentations support the compendium material and the e-modules exercises? Should there be more or less cases? Should the contents of cases be different? Other comments on the case presentation	<ul style="list-style-type: none"> <li>• It was interesting about the use – difficult to say, of course there was some.</li> <li>• Okay</li> <li>• I think the case presentations are fine. When you read the text, you are usually able to complete the exercises</li> <li>• Good cases, but not much of a linkage to the e-learning</li> </ul>

10. Please provide comments on your experience with working with e-modules	
A. Do you find that working with e-modules has provided you with a good and thorough understanding of the e-modules topics? Why/why not?	<ul style="list-style-type: none"> <li>• Frankly, I didn't use them much; it was difficult with the time allocation and not to have any lectures.</li> <li>• It is good for understanding terms and so. The discussion part is not good, because there is no feedback.</li> </ul>

	<ul style="list-style-type: none"> <li>• NO. I think that e-learning is a fine tool to complete, but I haven't learned what I expected of the course. Yes, I have understood the texts from the compendium, but that's not good enough. Somehow, I actually don't remember that much of the texts from the compendium, but have now a document with answers, so hopefully that will help.</li> <li>• No, because I see them more as a "have you read this and this" type of questions. I am not sure that there has been much learning.</li> <li>• No. The e-modules have gone through some few subjects but the general view is missing. This could be improved by developing the "overview page" a bit.</li> </ul>
B. Has working with e-modules improved your learning compared to traditional lectures? Why/why not?	<ul style="list-style-type: none"> <li>• That was the first e-module I ever had. I think for the first time or at all it could be (maybe) connected with ordinary lectures; let say on some specific forestry issues, as long forest economics is not a prerequisite.</li> <li>• In my opinion it should <u>not</u> be an alternative to lectures, more a supplement. It is important to have lectures to know where to focus and especially the ping-pong discussions are good.</li> <li>• NO. This way there is no discussion of the statements from the texts. When we are in the classroom, we discuss the different opinions and compare them to reality – that's good. Because then I make my own opinion about the topic based on a discussion, and not from a single text. I think I have learned very much from the classroom sessions, but I actually can't remember that much from my e-learning experience.</li> <li>• Rather the opposite. E-learning cannot take the teachers role. There is no chance to ask during the module. If you use the chat, it takes at least a day, and that is too long</li> <li>• No. I still prefer to have contact with a teacher despite the possibilities in e-learning.</li> </ul>

<b>11. Please list your comments and suggestions for improvement (also use the back of the page if necessary)</b>	
A. Mention the best about e-learning:	<ul style="list-style-type: none"> <li>• It left a lot of time free, but....</li> <li>• Flexibility about when to use it</li> <li>• I can make the exercises at night or whenever I want</li> <li>• The freedom to do it when it pleases me.</li> <li>• You can learn wherever and whenever you want</li> </ul>
B. Mention the worst about e-learning:	<ul style="list-style-type: none"> <li>• It was possible to complete E-module once in the beginning, that look more like e-testing. I think it shall be accessible at any time.</li> <li>• No ping-pong....</li> <li>• The release dates are a catastrophe!!! Way to late in the semester</li> <li>• The lack of teacher-student interface.</li> </ul>
C. Suggestion for improvements	<ul style="list-style-type: none"> <li>• The idea is good, but lectures are easier to remember, especially with student participation</li> <li>• Use the e-learning but keep the classroom discussions as I can see they were last year</li> <li>• Quit the multiple choices! Instead of auto sending a standard reply to our questions, there should be a teacher who corrects the exercises and sends them back. In that way, there will be response to what the students wrote instead of a tutor's opinion. I am aware that this takes a lot of effort from the teachers, but then again we use a lot of time on it as well.</li> <li>• Course modules should be available in time – otherwise it is difficult to motivate yourself to read the materials.</li> </ul>

## 8 Appendix 2: Course evaluation for Community Forestry (spring 2003)

**Table A2** Evaluation questionnaire containing the answers of nine students in Community Forestry

	Agricultural Development	Forestry	Other
1. What MSc programme do you expect to complete	5		3

	Very Low	Relative y Low	Average	Relative y High	Very High
2. How did you prioritize Tropical Forestry		1	2	3	2

	0 to 1	2 to 4	5 to 7	8 to 10	11 to 13
3. Please indicate the number of completed e-modules	1		2	4	1

	1 to 3	4 to 6	7 to 9	10 to 12	13+
4. Time to complete an e-module (including reading material and doing exercises)	1	4	1	1	

5. Please indicate your opinion on the structure of the e-learning home-page	1	2	3	4	5	Comments
A. Login and password	7			1		<ul style="list-style-type: none"> <li>Sometimes difficult to log in</li> </ul>
B. Study guide to e-learning	5	1		1		<ul style="list-style-type: none"> <li>Don't remember reading it</li> <li>Good and satisfy on it</li> </ul>
C. Links	6	1		1		<ul style="list-style-type: none"> <li>OK</li> <li>Great with links to further reading within each subject, only thing I miss is a complete links page (could be sorted out into subject links and 'other' general links, e.g. UNDP, UNEP, CIFOR, FAO, IUCN etc) – or add to the library page</li> </ul>
D. Course welcome page	5	2		1		<ul style="list-style-type: none"> <li>OK</li> </ul>

						<ul style="list-style-type: none"> <li>• Not all messages that were sent on email were shown under messages</li> <li>• Maybe a bit more information on each of the menu bars. E.g. 'Under e-modules you will find...' etc.</li> </ul>
						<ul style="list-style-type: none"> <li>• New way of learning some times confused to find it</li> <li>• It would be nice if it was available from any page in flec/AD pages</li> <li>• Some e-modules were late available</li> <li>• It would be great if it were possible to go from one e-module to another without having to go back through the CF folder and then to the overview page every time. E.g. keep a link to 'e-modules' on the left hand bar or make it a dropdown menu with all the modules</li> </ul>
E. E-module overview page	5	1	2			
F. Library page	5	1	1	1		<ul style="list-style-type: none"> <li>• OK</li> <li>• See links ("Great with links to further reading....")</li> </ul>
G. Discussion list	3	1	1			<ul style="list-style-type: none"> <li>• Didn't use it enough to form opinion. Good idea though</li> <li>• It is a great idea but nobody has really used it this term. Would it be an idea to raise a topic/question every two weeks? E.g. a current issue or case that is up for discussion in the media/scientific environment/political environment</li> <li>• (3 out of 9 did not comment on this page)</li> </ul>

1 = very good and 5 = lousy

<b>6. Please indicate your opinion on the <i>structure of the individual e-modules</i></b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Comments</b>
A. Introduction page	5	1		1		<ul style="list-style-type: none"> <li>• The setup is sometimes annoying with the relevant links different places on different pages</li> </ul>
B. Overview page	4	2		1		<ul style="list-style-type: none"> <li>• The setup is sometimes annoying with the relevant links different places on different pages</li> </ul>
C. Lessons learned page	5	1		1		<ul style="list-style-type: none"> <li>• The setup is sometimes annoying with the relevant links different</li> </ul>

						places on different pages
D. Read page	5	1			1	<ul style="list-style-type: none"> <li>The setup is sometimes annoying with the relevant links different places on different pages</li> </ul>
E. Exercise page	4	2		1		<ul style="list-style-type: none"> <li>The setup is sometimes annoying with the relevant links different places on different pages</li> <li>Would be nice with some illustrations and larger boxes to write essay answers</li> <li>Only problems in the beginning</li> </ul>

1 = very good and 5 = lousy

7. Please provide your opinion on the contents of the exercise (e.g. necessary? too easy or difficult?)	Comments
A. Type I (basic definitions, Terminology and concepts)	<ul style="list-style-type: none"> <li>It was good and well understand an concept and definition of CF</li> <li>Easy</li> <li>Boring!</li> <li>Are necessary to understand case study</li> <li>Good, sometimes difficult</li> <li>OK</li> <li>Necessary</li> </ul>
B. Type II (Understanding of content of literature)	<ul style="list-style-type: none"> <li>OK</li> <li>Appropriate</li> <li>OK, need to be 'pepped' up!</li> <li>Sometimes difficult</li> <li>OK, but bit hard – time consuming</li> <li>Sometimes questions confusing and unclear</li> <li>Sometimes difficult, depends on literature</li> </ul>
C. Type III (easy case)	<ul style="list-style-type: none"> <li>Learned some experiences from developing countries there was good to learn about those knowledge and interested</li> <li>Very specific (good)</li> <li>OK, it is sometimes difficult to understand what you want done</li> <li>Supplement information on each topic; show theory is turned into practice and if it does work</li> <li>OK</li> <li>OK</li> <li>OK</li> </ul>
D. Type IV (difficult case)	<ul style="list-style-type: none"> <li>Okay</li> <li>Rather difficult, it is sometimes difficult to</li> </ul>

	<p>understand what you want done</p> <ul style="list-style-type: none"> <li>• Supplement information on each topic; show theory is turned into practice and if it does work</li> <li>• Sometimes not clear what the questions is, and how long the answer should be</li> <li>• OK</li> <li>• There were no solutions, otherwise ok</li> </ul>
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8. Please provide your opinion on what should be prioritized in the development of e-learning and why?	Comments
A. User friendliness (e.g. more user interaction or better design of pages)	<ul style="list-style-type: none"> <li>• No idea</li> <li>• Multiple choice no read-friendly. Apply new design</li> <li>• Yep, to promote interest</li> <li>• Ok</li> <li>• The design is good and it is easy to use – just a bit boring – need some colour</li> <li>• Yes, interaction is a good thing. Discussions, response and explanations</li> <li>• Was ok</li> <li>• Would be great if there could be a “standard” answer to the multiple-choice questions that could be generated automatically after submission of e-modules. The course responsible or his assistant should still reply to text exercises. If there is doubt about any of the answers, students could use the discussion forum</li> </ul>
B. Technical issues (e.g. different links or software)	<ul style="list-style-type: none"> <li>• Ok, I can manage</li> <li>• Not really</li> <li>• There are</li> <li>• See question 5C (“Great with links to further reading...”)</li> </ul>
C. Scientific (e.g. different types of exercises)	<ul style="list-style-type: none"> <li>• Ok, I can manage</li> <li>• Yep, to promote interest</li> <li>• Some interaction exercises would be good</li> <li>• Priority should be made on exercises and their content</li> </ul>
D. Other	<ul style="list-style-type: none"> <li>• I think it sometimes is a hindrance to do them, rather I could use the time to read</li> </ul>

9. Please provide your opinion on the use of case presentations	Comments
<p>Do case presentations support the compendium material and the e-modules exercises? Should there be more or less cases? Should the contents of cases be different? Other comments on the case presentation</p>	<ul style="list-style-type: none"> <li>• Yes it does</li> <li>• They support. Nice with cases to relate to and seeing how they work (or don't)</li> <li>• Use as many cases as possible! They are the spice that makes the legislation texts edible</li> <li>• Case presentations support the compendium material, they should be more with different cases, problems, contents. It was really interesting by using photos and slides</li> <li>• It is good to have case studies – some more would be good</li> <li>• Yes, cases are a good support. It is important that case presentation also encourage-ages and has room for discussions</li> <li>• More cases would be nice</li> <li>• Case presentations were interesting and provided a good practice link, there could be more case presentations</li> <li>• I did not participate, since I am abroad</li> </ul>

10. Please provide comments on your experience with working with e-modules	
<p>A. Do you find that working with e-modules has provided you with a good and thorough understanding of the e-modules topics? Why/why not?</p>	<ul style="list-style-type: none"> <li>• There was to learn by e-module because it motivated me to read from compendium and find more literature in order to fulfil the specific answers on the e-module</li> <li>• Helped a little, but do not fully compensate for the learning process that you find when able to ask questions during a lecture</li> <li>• No, there is no argumentation between teacher and student</li> <li>• Yes, they forced me to read materials very carefully, they contain the most important information about each topic – indicate problems which we should focus on. They are some kind of summary of each case study, and it's very useful</li> <li>• Not always. Sometimes there was not time to reflect on what the main purpose of the e-module was because it took so long getting all the material read, and questions answered</li> </ul>



	<ul style="list-style-type: none"> <li>• I didn't use the e-learning optimally, so I am not sure</li> <li>• Didn't do them</li> <li>• Yes, because the understanding was tested on the end and I got the right answers</li> <li>• I used the questions and lessons learnt guide to revise for exams and that helped a lot in structuring the subjects, making it easier also to relate between subjects</li> </ul>
B. Has working with e-modules improved your learning compared to traditional lectures? Why/why not?	<ul style="list-style-type: none"> <li>• Yes it has motivated and challenged to the learners to read and understand more indebt in this subject</li> <li>• No. See above. E-modules can be replaced by questions in a book by the end of each chapter as in American teaching books</li> <li>• I'm not sure if it's improved my learning, but I found it quite interesting and some-thing different to traditional lectures. I could also individually choose my time for studying this subject</li> <li>• No. I was missing the lectures where the teacher presents his/her understanding of the written material</li> <li>• Yes, because I did something continuously and learning with the modules is more interesting than traditional lectures</li> <li>• Yes – better guidance of learning process and time to go in depth with issues. I.e. the learning process has not been “what has been said in the lectures” but rather, what I have learned by being guided to studying myself and that gives a better comprehension of the subject</li> </ul>

<b>11. Please list your comments and suggestions for improvement (also use the back of the page if necessary)</b>	
A. Mention the best about e-learning:	<ul style="list-style-type: none"> <li>• Relevance job opportunity for developing countries, there are lot issues on forestry and natural resource management and conflict in most of developing countries. It must be good for using that knowledge from this course.</li> <li>• The lectures</li> <li>• It is an interesting subject, which can be used in many contexts</li> <li>• The presentation and explanation of case study,</li> </ul>

	<p>flexibility of time for working with e-modules, list of questions for the exam</p> <ul style="list-style-type: none"> <li>• Got a clear understanding of what CF actually is – what are the pros and cons</li> <li>• Interesting topic, deals with complexity and lack of simple solutions</li> <li>• Relevant if you're on AD programme. Give new interesting perspectives and thoughts of how to deal with conservation and development</li> <li>• Case presentations about Vietnam, Ghana... e-learning in general</li> <li>• The possibility to truly follow a course from abroad is GREAT! I miss that in many other subjects. I enjoyed very much the division of course contents into sub-categories. This makes it very comprehensible to work with and structure, including for the examination!</li> </ul>
B. Mention the worst about e-learning:	<ul style="list-style-type: none"> <li>• E-modules</li> <li>• The lack of teacher-student interaction</li> <li>• Technical problems with access to e-modules because of CampusNet</li> <li>• Too much reading</li> <li>• Could be more lectures. Difficult to take the time needed for e-learning</li> <li>• Getting the modules too late, changing lecture times in short time</li> <li>• ..???!!!</li> </ul>
C. Suggestion for improvements	<ul style="list-style-type: none"> <li>• No, I think it is quite good enough</li> <li>• More lectures – fewer modules</li> <li>• Use the e-learning instead of exercises, not instead of lectures</li> <li>• Classroom meetings after each e-module (or 2/3) to summarise (sum up) materials/case study; some kind of final test (not exam) to verify knowledge (for students)</li> <li>• Both lectures and e-modules running parallel during the semester, so that one can choose between two types of learning. At least it should be very clear when students sign up that they are aware that the course is e-learning!</li> <li>• Encourage reading/discussion groups</li> <li>• Maybe little less course material, some more lectures so there would be more time for</li> </ul>

	<p>concentrating on e-learning. It's also difficult when so different length on what to read from time to time</p> <ul style="list-style-type: none"> <li>• Setting up e-modules in time, holding to the schedule</li> <li>• Would be great if we were allowed to bring power point presentations to the exam. It could still be "max 1 page" but the points could be structured onto a ppt, making it easier for the student to structure what he/she wants to say about the subject (but maybe my fellow students would not agree with me...). See also above</li> </ul>
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# 9 Appendix 3: Decision variables of hypertext documents

Table A3 Decision variables of hypertext documents

Variable	Comments
Fonts	Generally, the number of fonts used on a page should count no more than two to four different types. Using more only works to give the page a messy appearance.
Font sizes	HTML 1 – 7, that is font sizes 8, 10, 12, 14, 18, 24 and 36 points.
Headings	<p>HTML offers six levels as a standard, which can be combined with any of the available fonts. (You are not forced to use HTML heading codes, you may as well decide to use body text formatted in the desired way: using HTML codes do however help structuring HTML code).</p> <p>Generally, sans serif fonts are suitable for headings. Examples:</p> <p>Arial Helvetica Verdana Tahoma, etc</p>
Body text	<p>Body text corresponds to text used when writing standard paragraphs. In Microsoft Office products, body text ('normal') is Times New Roman,</p> <p>Generally, serif font types are suitable for body text. Examples:</p> <p>Times New Roman Garamond Georgia, etc</p>
Captions	<p>Captions are texts tied to photographs or illustrations. My personal opinion is that it is a good idea to write element type and number in bold when writing captions. For example, instead of writing:</p> <p>Table 3 Organisations and actors involved in developing e-learning, or</p> <p><b>Table 3 Organisations and actors involved in developing e-learning</b></p> <p>You could write:</p>

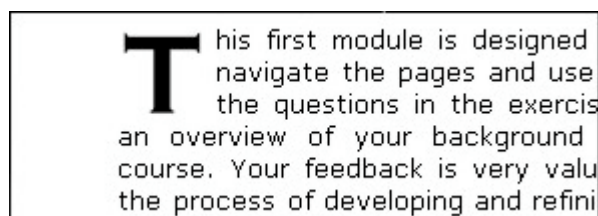
Variable	Comments
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**Table 3** Organisations and actors involved in developing e-learning

In HTML, captions can be vertically placed above or under a table with the ‘Caption’ code. HTML caption works only with tables. Captions for photos and other illustrations than tables are thus best created by placing such elements in a table.

**Initials (capitals)** The probability that people will read a text is higher when the text begins with an initial than when it does not.

There are an endless number of initials to choose from; browse the internet to find a set that suits you. Figure A3 shows the initials use at the beginning (‘Introduction’ pages) of each module on the Tropical Forestry e-learning website.



**Figure A3** Drop cap/initial used on the Tropical Forestry homepage (font: Copperplate Gothic Bold)

Notice that initials should not be used excessively. A rule of thumb is that you should use a maximum of one on each page. Also, it is a good idea to save their use for special pages alone. Therefore, we have only used initials on the ‘introduction’ page of each of the sixteen modules in the Tropical Forestry course.

**Bold, italics, underline, etc** Rules of thumb:  
Normal is always a good choice for larger text bits

**Bold fonts** can be used as in normal word processing programs

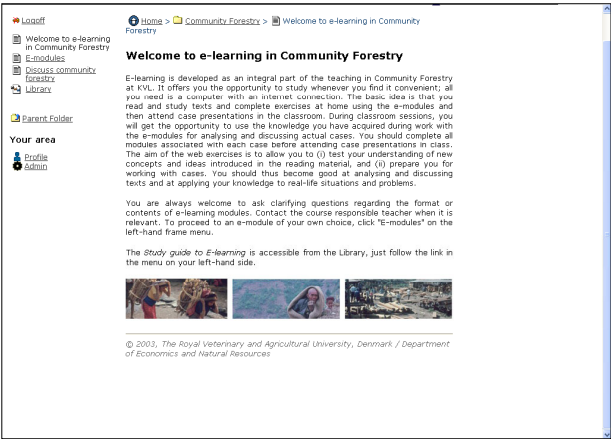
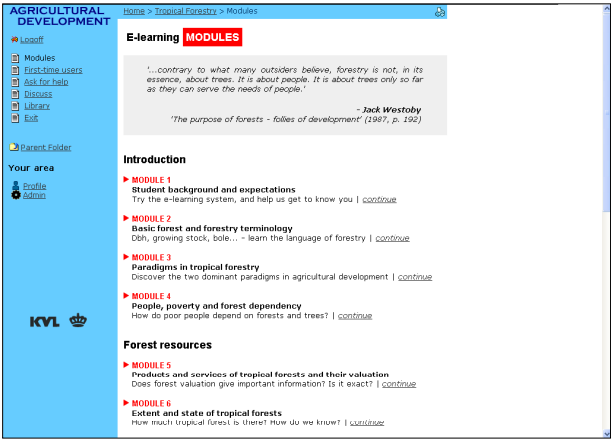
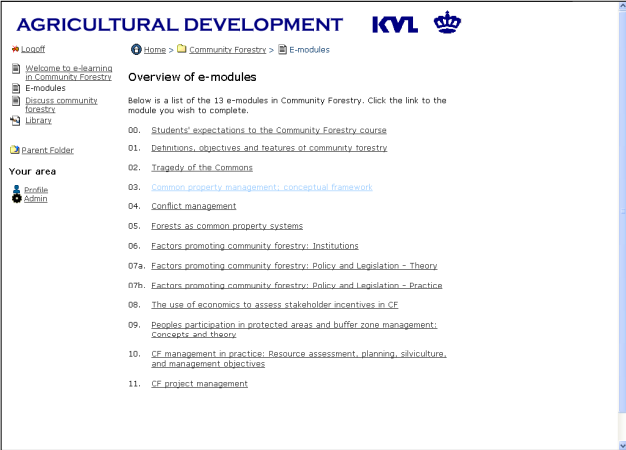
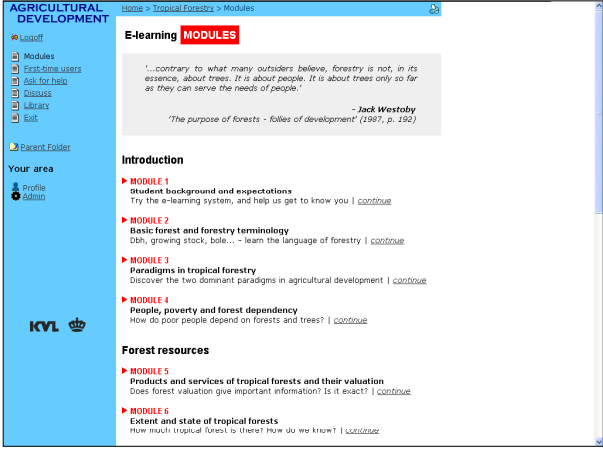
*Italic font* is not shown well in web browsers, especially not with small fonts

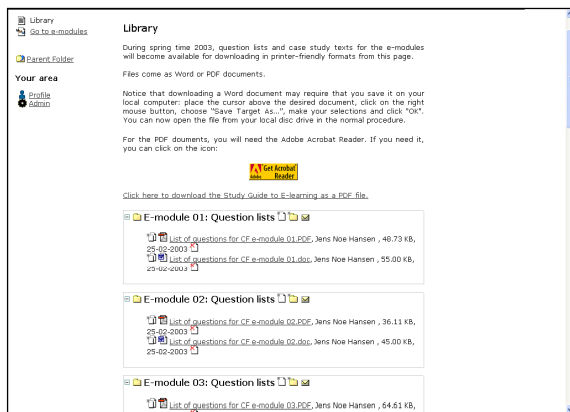
Underlined text should be reserved for hyperlinks to avoid confusion (underlining hyperlinks is a default setting for most internet browsers)

Text effects, such as blinking, moving, excessively coloured or otherwise heavily emphasised text should generally be avoided.

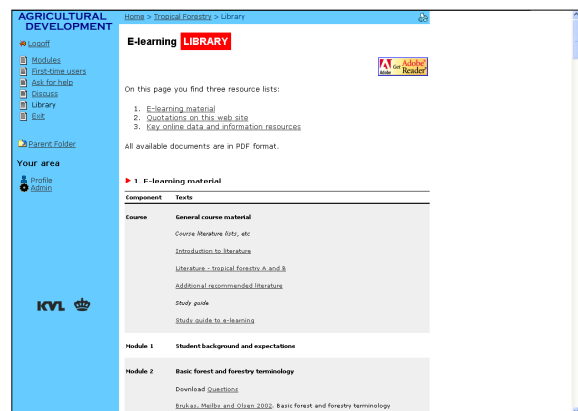
# Appendix 4: View of design changes

**Table A4** Comparison of core pages that have been pedagogically improved (Tropical Forestry, autumn 2003) with those that have not (Community Forestry, spring 2003)

Community Forestry Not changed	Tropical Forestry Changed
	
Main page: Welcome to e-learning in Community Forestry	Information on Welcome page in a new First-time users' page, with is not the main page
	
Overview of e-modules. Modules are presented in a rather uninspiring list	E-learning modules. This page has been made the main page. Modules have been marked with a red triangle and text. Modules have been organised under four headings. A quotation has been included

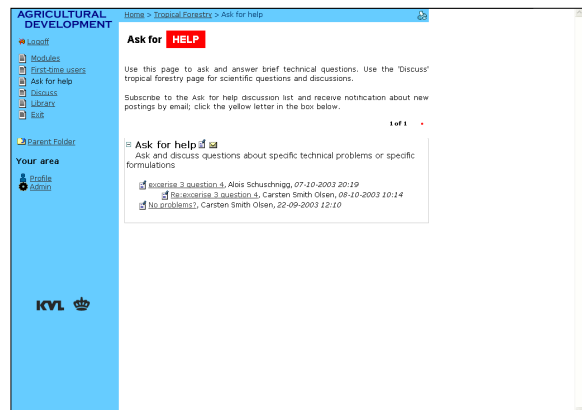


Library contains question lists and case study texts exclusively



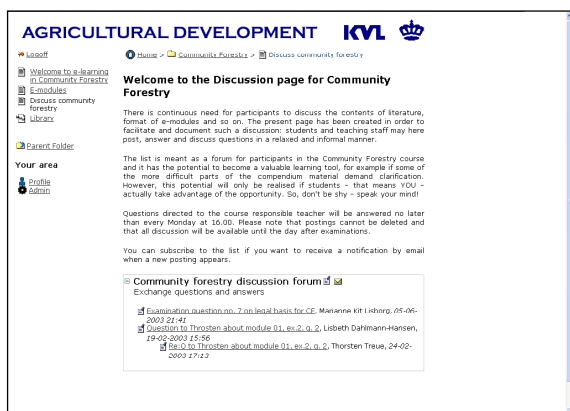
Library contains listings of all materials used in the e-learning course and on the website. The layout has been drastically changed

Not available



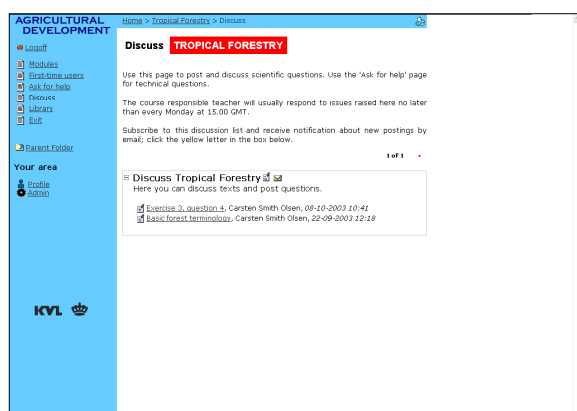
Ask for help. A new discussion group to handle questions of a technical character

Community Forestry  
Not changed



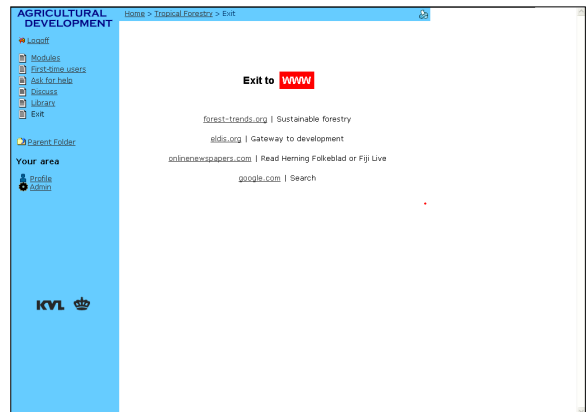
Welcome to the dissusion list for community

Tropical Forestry  
Changed



Discuss tropical forestry


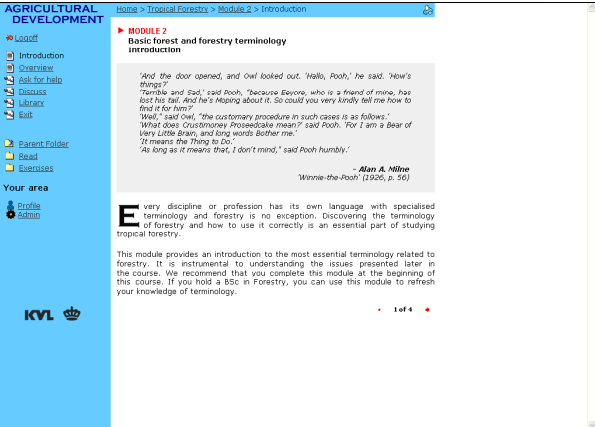
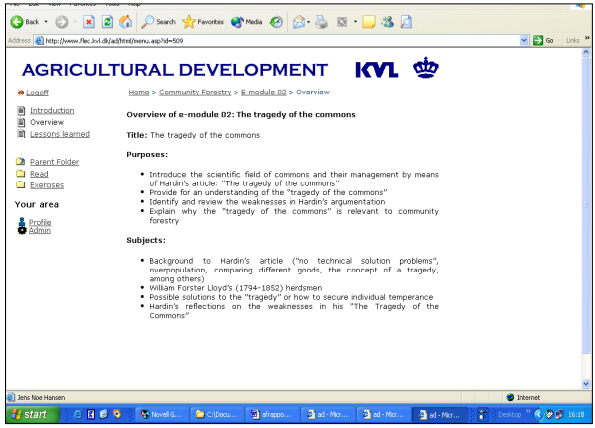
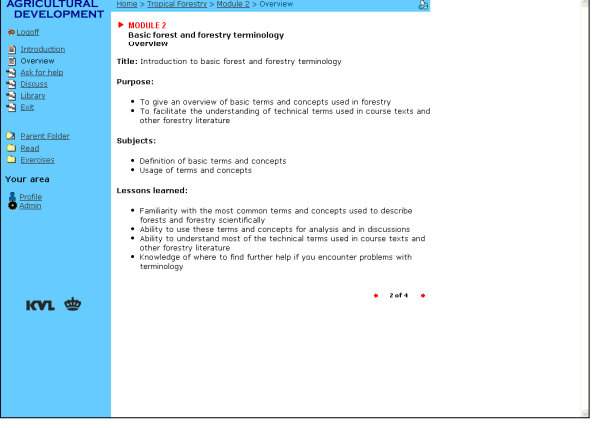
Not available



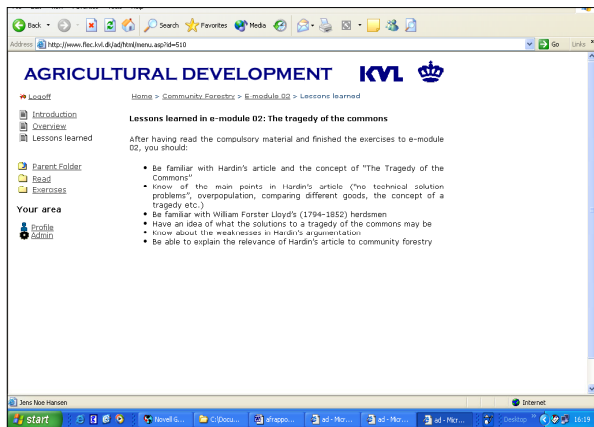
Exit page. A new page



**Table A5** Comparison of module pages that have been pedagogically improved (Tropical Forestry, autumn 2003) with those that have not (Community Forestry, spring 2003)

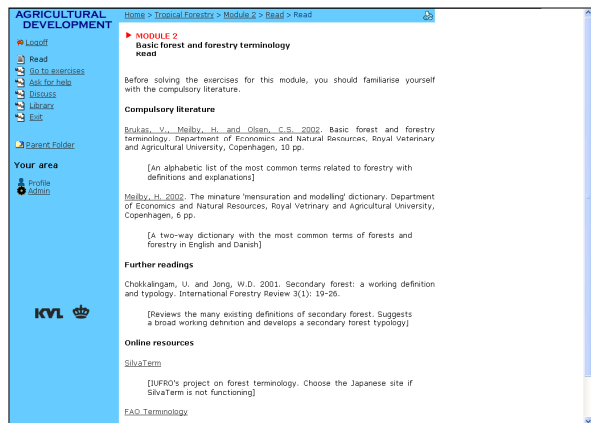
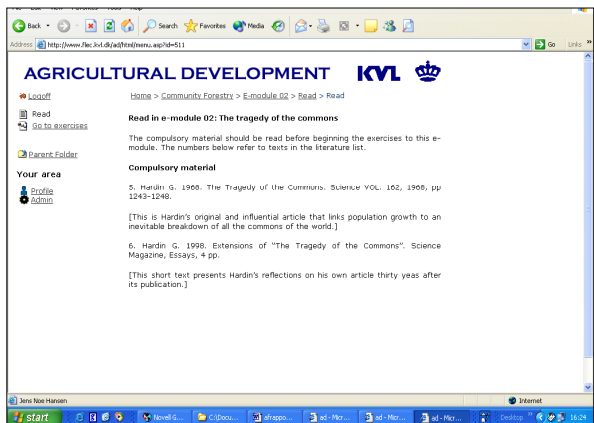
Community Forestry Not changed	Tropical Forestry Changed
 <p>Introduction page</p>	 <p>Introduction page. New heading, inclusion of quotation (rather long here), drop cap. Red arrows (bottom right) to guide the user through the module</p>
 <p>Overview page (title, purpose and subjects)</p>	 <p>Overview page (title, purpose, subjects and lessons learned). The Overview and Lessons learned pages have been combined into a single page</p>

## Community Forestry Not Changed



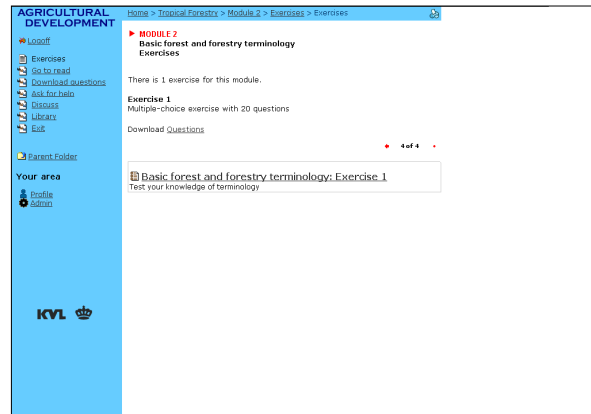
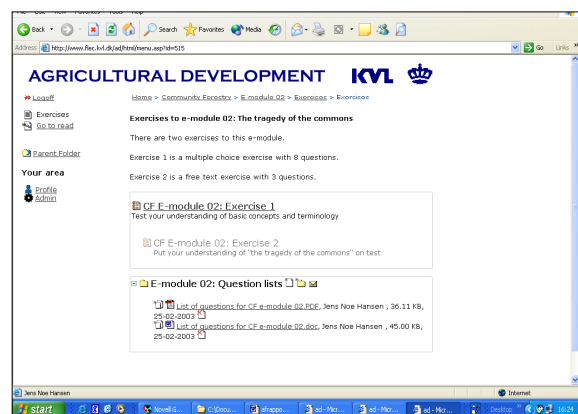
## Tropical Forestry Changed

Includ in Overview



Read Page

Read page



Exercises page

Exercises page