

# DESIGN OF AN ON-LINE TUTORIAL FOR DECISION MAKERS IN HONDURAN HILLSIDE AGROECOSYSTEMS

J. SWINDELL

*Royal Agricultural College, Cirencester, Gloucestershire, GL7 6JS, UK*  
*E-mail : julian.swindell@royagcol.ac.uk*

## ABSTRACT

This paper discusses the design and creation of an internet based tutorial for training decision making stakeholders, from the hillside agroecosystems of Honduras, in the use of a complex spatial decision support system. It has been created by a partnership of educational and NGO institutions from several countries, based on educational research at the Royal Agricultural College, England (Swindell 1999, Swindell and Sutphin 1999) and on the decision support research at the International Centre for Tropical Agriculture (Knapp and Leclerc 2000) in Cali, Colombia. The tutorial considers both the ways that users *should* use the decision support system and ways they *might* use it. It addresses the problems of how to navigate through unfamiliar websites, how complex data can be displayed in an understandable way, how problems of slow internet connections can be tackled and how people inexperienced in using information and communication technologies can be given easy access to complex data.

## INTRODUCTION

The Royal Agricultural College (RAC) was a partner in the project *Methodologies for Integrating Data Across Geographical Scales in a Data-rich Environment: examples from Honduras*, led by the International Centre for Tropical Agriculture (CIAT). The prime purpose of the project was to make an existing, very large collection of spatial, biophysical and demographic data accessible to all of the stakeholders in Honduras in Central America at their individual scale of interest (CIAT 1998). These stakeholders range from small farmers, through local and national politicians to the NGOs and funding bodies supporting the project. The project had three intended outcomes; a set of scale consistent spatial databases with associated analytical tools; a prototype decision support system (DSS) based on these databases; and a tutorial, designed to show both users and developers how this DSS could be used. The intention was that this DSS would be transferable to other tropical countries with comparable agroecosystems to Honduras. The databases and the tutorial were completed by CIAT and RAC in July 2000. The full DSS will be completed if further funding for an extension to the project is forthcoming.

## THE OBJECTIVES OF THE TUTORIAL

The RAC's prime input to the project was the design and creation of the interactive tutorial forming one of the three intended project outcomes. The tutorial addresses three issues:

- First, it provides a simulation of how the final DSS (which has still not been completed) will look and work and as such, acts as a proof of concept of the DSS for the developers and the project funders.
- Second, it provides instruction to users of the DSS, the Honduran stakeholders. In this it will act both as a tutorial for new users and as an context sensitive help system during normal DSS use.

- Third, it acts as the repository of all of the research documentation and background materials produced during the course of the project. This will give all users and developers of the system full access to the research and data underpinning the DSS.

### **Proof of concept**

Any DSS is complex both in its structure and in its use. The assumptions underlying models may be opaque. The way a user must work through a hierarchy of choices and decisions can be anything but intuitive. The output of a query can seem illogical. The structured databases and their tools which will form the core of the Honduran DSS have been created (Knapp and Leclerc, 2000), but the full DSS itself had not been completed by the end of the project (September 2000). When it is completed it must allow users to define who they are, their scale and locality of interest, and the problems and goals that they wish to address. It must then select the appropriate data from the database, aggregate it at the scale of the users' interest, and present it for query, using complex tools and models, in a way which is understandable to the user.

To address these complexities, a tutorial in the use of the Honduran DSS was developed by the RAC before the full DSS itself was assembled. This tutorial mimics the intended DSS, being designed to look like a full working system and acting as a functional prototype for experiential development of the DSS itself. All processing is simulated, the range of localities and scenarios is predetermined and the output is fixed. These processes are linked in a flow chart of inputs and outputs which will present the stages of the decision support system to the tutee (fig 1). Tutorial users are given explanations of each stage and can make choices from options, although these are strictly limited. They can also give detailed feedback to the development team at every stage, to contribute to the refinement of the final DSS.

This tutorial has been subjected to scrutiny by the development team, representative stakeholders and the project reviewers in a workshop in Costa Rica in July 2000 (Veldkamp, Berdegúe and Horton, 2000). Its development continues through interactions with stakeholders in Central America, as the tutorial is fully accessible on the internet and incorporates a feedback and discussion group management system (Swindell 2000). The immediate comment from Central American users was one of appreciation, that the tutorial represented one of the first outputs from a development project which they could interact with and comment on themselves.

### **Instruction and help system**

The user help system explains the DSS process as well as how to use the tutorial interface. These explanations are accessed through links in each stage of the tutorial. If the interface is displaying a series of choices, this link will explain the significance of the choices, and what will happen after any choice is made. If the interface is displaying the results of a process, the explanatory window will say what the process did and what will be done with the results.

This same explanatory help system will be accessed from the full DSS by cross links to the tutorial. The links between the DSS and the tutorial will be context sensitive, so that the explanatory support in the tutorial will always be relevant to the stage in the DSS that has been reached. This will allow the DSS itself to be relatively uncluttered.

### **Repository of resources**

The tutorial contains all of the background documentation to the DSS. It is possible to call up descriptions the process models which are used, data catalogues, metadata indices, credits for

the project and contacts for further development of the DSS. Detailed discussions on how to use tools incorporated in the full DSS are given.

## THE TUTORIAL DESIGN

The interface to this tutorial will be complex, but it must be simple to use and easy to understand. This is achieved by examining how people might use it, rather than how they should use it. This is similar to the error checking process in computer programming. It is easy to design a program to carry out an intended action when given the correct input. It is far harder to design a program that can react to the wrong input in such a way as to put the user back on the right track without disrupting the process. This challenge has been addressed in the tutorial under the headings of user familiarity, structured navigation and context sensitive explanatory help and warning systems.

### **Keeping the interface simple and familiar**

No interface will be familiar to a first time user, and some of the users of this DSS will be first time computer users. Having said that, the most widely used interface is the web browser. It is more or less the same in every language, on every type of computer, and with every operating system. Its modus operandi is simple. You point and click on hyperlinks to display pages. You read text, listen to sounds or view images. You make choices on pages by the same point and click technique. Those choices result in new content being displayed. There is a minimum of text input, so the keyboard is a very secondary input device.

The process is essentially sequential in that you navigate through the content with simple forward and back commands. Cross references are achieved through hyperlinks or by hidden scripts which are activated by specific input. The speed at which web browsing can be understood and used can be quite amazing, but is well known to any parents with young children! The complexity and sophistication of what can be done through this simple interface increases daily.

The Honduran DSS and its tutorial will exploit the familiarity, simplicity and functionality of the browser interface to the maximum extent. To this end it is hoped that the users will never leave the browser to launch another program, but will interact with the data entirely through the browser window. There will be tremendous activity by database management systems and analytical programs in the background, but the user does not need to know about this. She needs simply to provide input and receive output, and the browser can do that for her.

### **Logical navigation through the tutorial**

Navigating through the World Wide Web is a simple, sequential process. We just follow links from one place to another. Because it is so simple, it is very easy to get lost. We branch off in unexpected directions; windows may use complex nested frames; new windows may open automatically and in some cases the user is invisibly redirected to unrequested sites. This problem of disorientation is addressed in two stages; first, by clearly defining the logical route(s) through and around the web site, and second, by designing the interface so that "finding your way back" is as easy as possible and that wandering searchers are consistently directed back onto the intended path.

## Defining the navigation flowchart

The first design stage involves flowcharting the decision making process, to discover the stages where user input is needed, where supporting data must be introduced, where information streams interact, where functional models can be used and where feedback loops occur (figure 1). The flowchart for this tutorial maps an eight stage process, with the very earliest stages defining the scales and locality of the users interest. All data needed for later stages will then be selected from the full database to cover just this locality and will be presented at a suitable level of generalisation for the scale of this locality. The user then inputs more indeterminate information relating to desired goals, time scales for achievement and scenario modelling. Any of these stages can be reiterated with variations to the input. In addition, and very importantly, any user can role play the scale and locality and goal analysis of another user, to better understand why they may have made the decisions they did. This is particularly valuable for stakeholders at the local scales, who may not understand how regional and national scale decisions came to be made.

This flow chart establishes the stages the tutorial must work through, and the interface is designed to display each stage in turn, and to allow simple navigation back through completed stages.

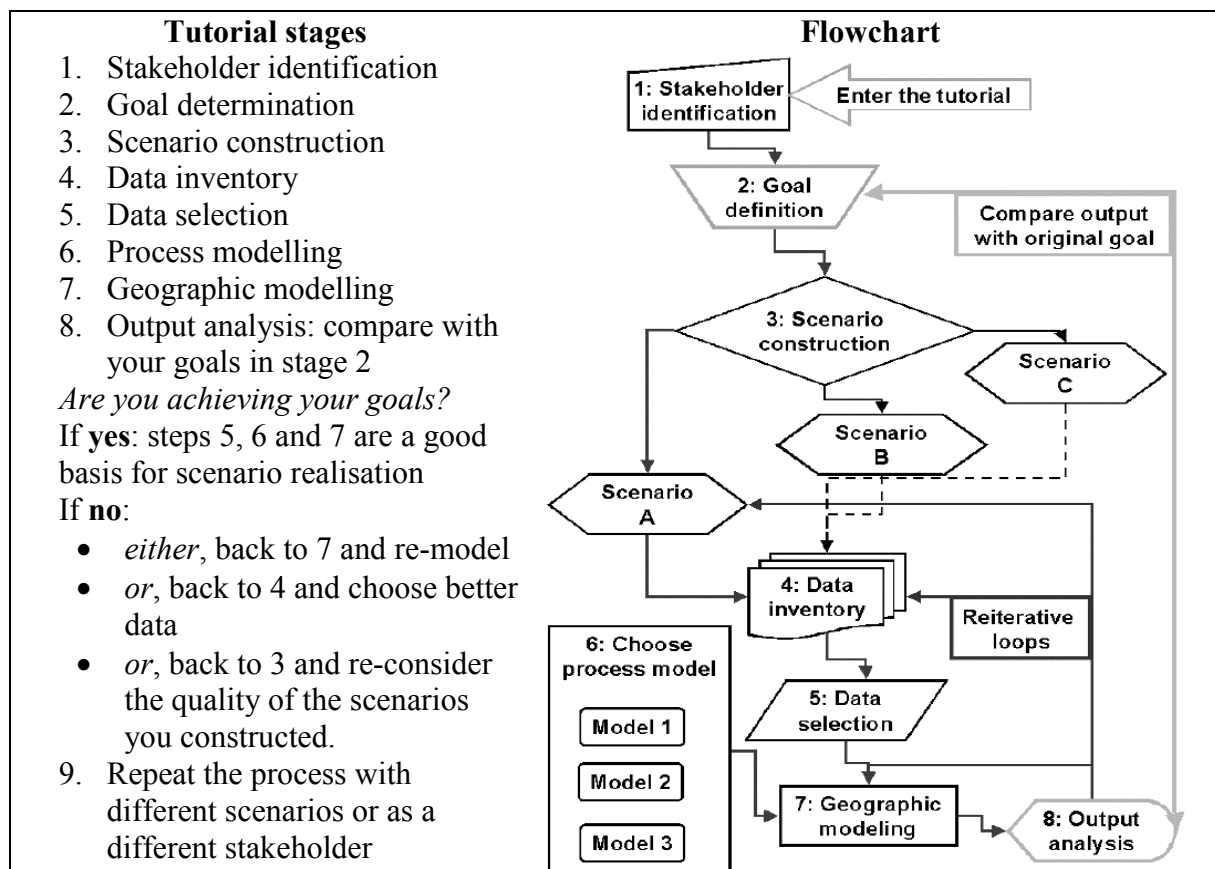


FIGURE. 1 Tutorial user flowchart

## Keeping to the decision making flowchart

Designing the browser interface for easy navigation is complicated. The form adopted here is one developed at the Royal Agricultural College and used for a number of undergraduate teaching programmes (Swindell 1999) This is essentially a three framed web site, which is a

fairly common layout, with the addition that navigation menus (referred to as stage menus below) develop as the users progresses through the web site. Each completed section is added to the next menu. This gives a visual clue to progress and location, and also allows steps to be retraced or reiterated.

No stages of the tutorial open in new windows as this can be confusing to inexperienced users. There may also be a limit to the number of open browser windows that a particular computer can support, causing problems if this is inadvertently exceeded by the tutorial design. All explanatory and warning messages do open in new, small pop up windows. These are designed to close automatically after a short period of time.

The Home frame is a simple link that always takes the users back to the start of the tutorial. This is the panic button. If all else fails, this can be clicked and the whole process started again from the beginning. This frame is always the same, consisting of a simple image (a map of Honduras in this case) and it is present in all displays.

The Stage frame is used for navigation and user support. It is a simple menu linked to the current stage of the tutorial. Some items always appear: a link to the DSS documentation, a basic help button and a link to stage definitions. In addition, it contains a link to the start of the current stage and to each of the preceding stages in the tutorial. As one stage is completed and the next started, a new stage frame is displayed, showing the new stage and adding the completed stage to the list. If a user is confused, she can always go back to any earlier stage and retrace her steps. The stage frame also has a link to a feedback page. This is stage sensitive, so that any feedback given will automatically link to the stage that generated it.

The data display frame is where the user makes choices, views maps and other data and gives input to the system. Actions in this frame will result either in a new display in the same frame, showing the consequences of those actions, or, if the action completes a stage in the tutorial sequence, a completely new frameset with a new stage frame and data display frame.

## CONTEXT SENSITIVE HELP

The tutorial itself is intended to be a help system for the finished DSS. To do this successfully it should be simple enough in its own use not to require an extensive help system of its own. To this end, there is only a simple help page, which explains how the links work and how the tutorial is structured. After that, help is given in the form of explanations and warnings. Explanations are called up by clicking a link entitled Please explain, which appears on every page and calls up a small explanation window which explains what happens at this stage, and what the users will have to do.

Warnings occur automatically when the user gives incorrect input to the system. For example, in the real DSS, the user will enter their personal details, in order to define their area of interest. In the tutorial, they select from a range of predetermined users. Not all of these have been defined yet. If a user selects one of these undefined types, a warning window opens telling the user this and advising which of the options is currently functional.

In the completed DSS, the help system will consist of cross links from a stage in the DSS to the equivalent stage in the tutorial. This will then give an explanation to the users of what should be happening before going back to the DSS.

## TECHNICAL CONSIDERATIONS

Both the tutorial and the DSS will be internet based. This can be a problem in developing countries with fragile telecommunications infrastructures, but it has positive advantages that are felt to make it worthwhile. The databases can be held and maintained by supporting institutions and any internet user can access them. New functionality can be added to the system at anytime and will be immediately available to the end users. The users can give feedback on problems or new requirements, which can then be added to the system.

Every effort has to be made to ensure that slowness of internet access does not interfere with the utility of the tutorial. Much of the tutorial is image based and JavaScripts are used which pre-load images whilst users are carrying out tasks such as reading instructions or filling in forms. This makes maximum use of inactive time to transfer images over the internet. As soon as the first image is displayed, all other images will have been downloaded.

## CONCLUSIONS

The tutorial has been well received by the development team and by the Central American stakeholders who have attended its demonstrations. The project review team had reservations about the possibility of some of the simulated processes being achievable in the final DSS (Veldkamp, Berdegué and Horton, 2000). This related particularly to the ability of an inexperienced end user to run a complex mathematical model of an ecosystem and to understand the output. This will be addressed by running these models under controlled conditions with different datasets, to see if these outcomes can be achieved in reality. The DSS development team found the proof of concept aspect of the tutorial especially useful as it enabled them to see how their own individually developed tools could fit into complete system. The challenge is now to make these work in the way they have been presented in the tutorial.

The full tutorial can be seen on the RAC website at URL:  
<http://www.royacol.ac.uk/ciat-interface/>

## REFERENCES

- CIAT (1998) Project PE-3 annual report Community management of watershed resources in hillside agroecosystems of Latin America CIAT, Cali, Colombia
- Knapp E. B. and Leclerc G. (2000) Methodologies for Integrating Data Across Geographic Scales in a Data-rich Environment: Examples from Honduras CIAT, Cali, Colombia
- Swindell J. (2001) Community based decision support systems in Honduras; developing an internet based tutorial for end users *Proceedings ROOTS 2000*, RICS London  
URL <http://www.rics.org/respdf/roots2000swindell.PDF>
- Swindell J. (2000) The HcDSS on-line tutorial URL: <http://www.royacol.ac.uk/ciat-interface>
- Swindell J. (1999) Developing open learning systems: moving painlessly from the classroom to distance teaching, *CTI newsletter 26 p 6*, CLUES Aberdeen University
- Swindell J. and Sutphin H. D. (1999) Open learning in agriculture, maintaining quality over time and distance, proceedings of *EFITA '99*, University of Bonn-ILB pp 491-499
- Veldkamp T., Berdegué J. and Horton D. (2000) *Methodologies for Integrating Data Across Geographic Scales in a Data-rich Environment: Examples from Honduras- a report to the Ecoregional Fund to Support Methodological Initiatives* The Hague, Netherlands