finalreport

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SGS Pasture Model on Ed-Serve

Final Report

partner logo

Abstract

This concept project was conducted to demonstrate the feasibility of using the Sustainable Grazing Systems (SGS) Pasture Model to assist in undergraduate education, especially in relation to teaching aspects of the key sustainability factors of deep drainage and nitrate leaching within various pasture systems.

The project resulted in the successful deployment of the SGS Pasture Model via thin client from the eD-Serve portal at the University of New England; the initial testing was favourably received by students and academic staff alike. There is great potential to enhance the understanding of complex agricultural ecosystems using this tool but, in order to get widespread use across the education sector, a specialist support person may be needed to ensure success.

Executive Summary

This project was conducted to test the feasibility of deploying the SGS Pasture Model by thin client to a range of educational institutions to provide the opportunity for enhanced learning about grazing system interactions.

The SGS Pasture Model was successfully modified and deployed via thin client from the eD-Serve portal and found to be of great interest to both undergraduate students and academic staff. Also a constraints facility was added to allow lecturers to restrict the number of options that students can modify.

The successful proof of this concept means that Meat and Livestock Australia can now be more confident that it could recommend the use of its SGS Pasture Model to enhance the training of future professionals in the livestock industry in universities across the nation.

The use of this model for teaching follows on from the successful use of a range of models for teaching (e.g. GrassGro and GrazFeed) in a project supported by Australian Wool Innovation (June, 2002- May, 2005) in which approximately 1300 students per year benefited. There are opportunities for both MLA and AWI to consider co-sponsoring one or two decision support specialists to enable teaching using such models on a broader scale in Australian universities, leading to greater relevant problem-solving skills of future professionals who will work in the livestock industry. For example, when used appropriately in the teaching curriculum, the gaining of experience with this model will enhance students' understanding of the challenging concept of 'sustainability' (e.g. changes to groundwater and nitrate leaching).

Both MLA and AWI will be aware that a range of universities have submitted a proposal to the Federal Department of Education, Science and Training (DEST) for a Collaboration and Structural Reform grant to enable the wider use of Decision Support Tools in higher education with the aim of enhancing problem-solving skills in graduates. If this grant is awarded by DEST, this will present a significant opportunity for leverage by a range of R&D Corporations such as Meat and Livestock Australia and for much greater impact to be realised.

Contents

1 Background

The University of New England has used a range of Decision Support Tools to assist in teaching problem-solving skills to undergraduates since 1999; this approach was broadened out to include collaborators at up to 8 other Australian universities in a project funded by Australian Wool Innovation (from June 2002 – May 2005) which saw the use of tools such as GrazFeed and GrassGro served out in thin client mode to students from 11 campuses of these universities.

This project was designed as a proof of concept project to enable the suitability of the SGS Pasture Model (funded by Meat and Livestock Australia and collaborating agencies within the Sustainable Grazing Systems Key Program (1998-2002)) to be assessed for teaching purposes.

2 Project Objectives

2.1 Purpose and description

To undertake a proof of concept project enabling the serving out of the SGS model using the UNE "eD-Serve" thin client system, for the purposes of teaching undergraduates.

2.2 Objectives

By June 30, 2005, the Research Organisation will deliver to MLA:

1. A modified code in the SGS model to enable operation in thin client mode such student can save their own simulations in their own directories;
2. Curriculum developed with supportive learning materials to enable exploration of the entire grazed ecosystem including aspects of climate variability within and between years, different climatic experiences at up to six locations around Australia, drainage and run-off components of the water balance, the likelihood of leaching, pasture growth and composition, and animal growth;
3. Implement delivery of the SGS Pasture Model via the eD-Serve, to four university institutions around Australia.

There were three components to this project:

1. Code development by Ian Johnson to enable student input and output files to be stored in their own directory and also the development of initialisation files so that the learning experience by the student can be controlled by the lecturer; this work needed to be done in close consultation with UNE's eD-Serve administrator so that testing could be carried out iteratively;
2. Support for the software, hardware and eD-Serve administrator to mount and test the software in thin client mode and to register test classes, and;
3. Support by the Decision Support Specialist (Ms. Helen Daily) to support lecturers at three to four institutions to test the first implementations of the SGS model in teaching.

3 Methodology

3.1 Putting SGS Model on eD-Serve

After consultation between the eD-Serve coordinator and the model developer, the SGS Pasture Model was modified to allow it to be run in 'thin client' mode. This was tested on the UNE eD-Serve server; several iterations were needed to overcome some small obstacles encountered at first.

The SGS Pasture Model was modified to allow the academic user to apply constraints to limit student options to those required for specific learning exercises.

3.2 Training in use of the SGS Pasture Model

The Decision Support Specialist (DSS) was trained by the model developer over a period of one week. This allowed the DSS to become familiar with the operation of the model and with some of the experimental datasets published in the special edition of the Australian Journal of Experimental Agriculture – especially those for the Vasey site (Hamilton, VIC) and the Wicks site (Manilla, NSW).

Learning scenarios based on these sites were then created as PowerPoint presentations which were subsequently put up on the eD-Serve portal (http://ed-serve.une.edu.au) to enable various lecturers to download them as necessary. A document titled 'Using the SGS model on eD-Serve' was also created for downloading from the Lecturers' Resources section of the web portal. These resources were intended as 'self-help' materials for the lecturers to guide them in use of SGS Pasture Model for teaching. If a representative of MLA wishes to be authorised to gain access to these lecturers' resources to explore their content, please contact the author of this report.

4 Results and Discussion

4.1 Functionality of model in thin client mode

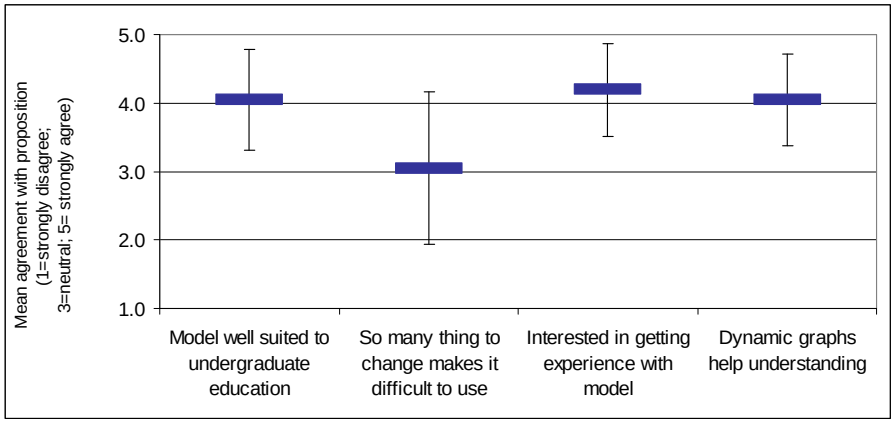
Testing of the model by a range of academic users showed that the model worked well in thin client mode from the University of New England server at a range of sites including on-campus in Armidale and from remote locations such as the Wagga campus of Charles Sturt University.

4.2 Results of student survey

The results below show the mean and standard error of responses to a wide range of questions put to students following a demonstration of the model using the thin client system.

The class surveyed was a class relatively inexperienced with the use of decision support tools (2nd year Agronomy 211 unit). By the time of this demonstration, they had used the model GrassGro in two different units. 21 valid responses were received.

Questions 1-4

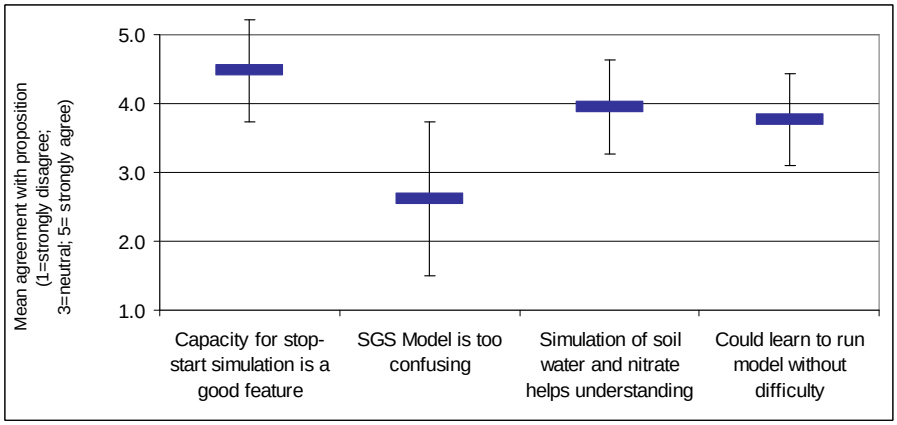


Agreement that the model is well suited to education and ambivalent response regarding perceived complexity. It is envisaged that when implemented, the constraints facility will reduce the likelihood of students being overwhelmed by too may options at first use.

High degree of interest indicated.

Appreciation of dynamic nature of graphs visible during simulation.

Questions 5-8



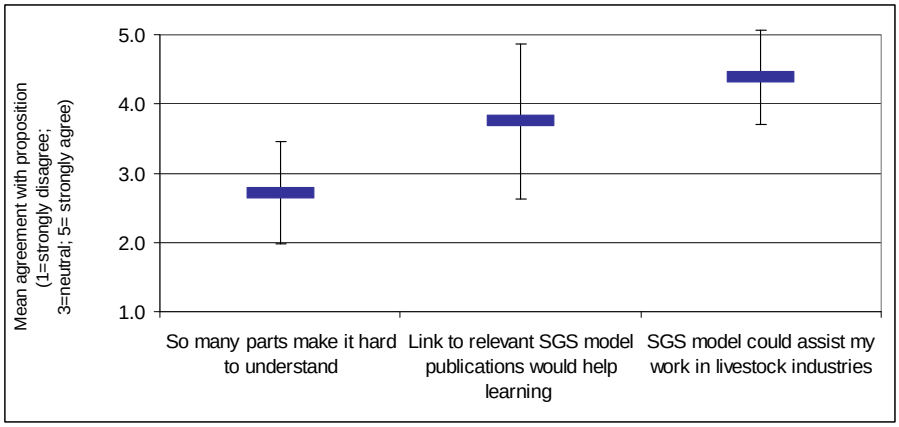
High level of agreement that stop-start feature is desirable for learning about simulations.

Some variable opinions about the level of confusion about how the model works.

Acknowledgement that water and nitrate simulation assists understanding.

Agreement that students could learn to run the model without difficulty.

Questions 9-11



Mild level of disagreement that the model's complexity affects understanding.

Moderate agreement that linking to relevant SGS publications would help.

Strong agreement that use of the SGS Pasture Model could assist the undergraduates' work in the livestock industries.

Other comments received from students:

- "I think once learned, the SGS model would be beneficial over a wide range of learning topics - showing all aspects.
- With a bit of work with it, it may be good to work with. Once more understanding is gained I can see its capacity.
- It is hard at this point for me to judge how difficult it would be to learn because I have not yet sat down and tried it – but I feel that once I can understand how to use it, it will be very helpful. It looks difficult to learn though.
- This modelling program seems to me to be of more use than GrassGro. It takes into consideration many different components including soil fertility.
- I think using this system as a part of the course could be very useful providing that the level of difficulty is reduced and with very good instructions and more time. If it can be adapted to the course it would be beneficial. But I think the use of GrassGro should be learnt first as a backgrounder.
- Most people are turned off by books. Showing people to use the program with a book would be the best method. The large amount of options will be confusing until people can use it. By the end of this demonstration I was no longer confused. Will have great educational/research success.
- Maybe could be adapted to cropping as well. I think it has more use than GrassGro.
- Good idea and program - but very 'full on' - with so many features. If it was scaled down at first and then geared up when an understanding is reached, this would help in a lot of areas.
- Great model but not the be-all-and-end-all as it is still only a simulation.
- Important not to lose practical aspect of the course, rather than relying too heavily on computer simulated programs.
- I think it looks more user friendly than GrassGro. Graphs easier to understand. Bigger picture than GrassGro.
- It looks very hard to work out however, with assistance, I think it could be beneficial.
- I think this is a useful program and I can see that it's a very useful tool! The more undergraduates use it, the better we will be trained to use it in the workplace. It would take a fair while for us to use and understand.

- Looks better than GrassGro. Once I learnt how to use it, it would be excellent.
- I don't like the black graphs! It will be difficult to use at first and to fully comprehend all aspects, however, after a few times it should become a lot easier". [NB – the background to the black graphs can be changed under the model's options].

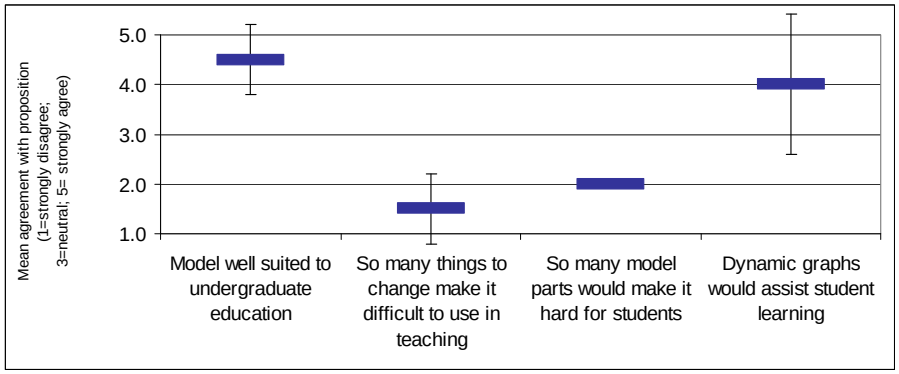
4.3 Results of staff survey

The first invitation to use the SGS Pasture Model for teaching was sent out in mid April, 2005. This turned out to be too late for those lecturers approached to use it for teaching in semester 1 and their teaching plans had already been finalised into schedules.

The package requesting academic staff to 'road test' the SGS Pasture Model via thin client was sent out to 12 academic staff at 6 universities in early June 2005. A number of lecturers responded that they had insufficient time to devote to this at this time, given that it was late in semester 1. Also a number of respondents were about to mark exams and some were leaving for the International Grasslands Congress in Ireland. A number offered to carry out the evaluation during July 2005, due to time constraints.

At the time of writing, only two responses had been received. It is anticipated that additional responses will be received over coming weeks and a revised summary of survey responses will be sent to MLA when these have been received.

Questions 1-4

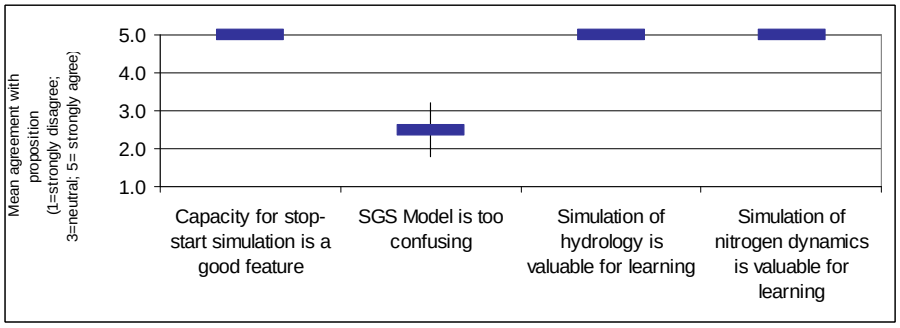


Agreement that the model is well suited to undergraduate education.

Strong disagreement that the many options for changing settings will make it difficult to use in teaching. Also disagreement that complexity will make it hard for students.

Agreement that dynamic graphs will assist with student learning.

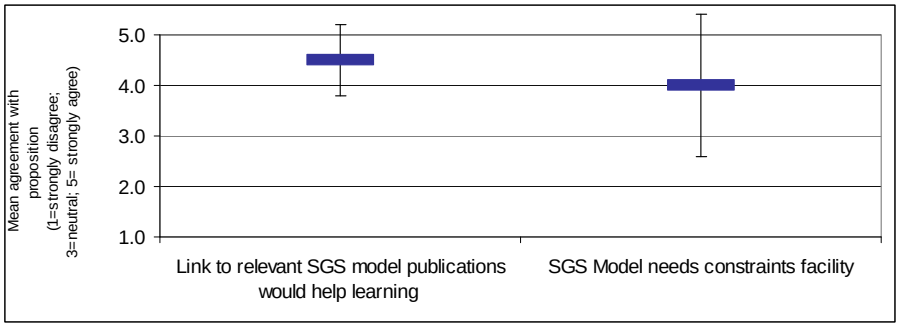
Questions 5-8



Strong agreement about value of stop-start feature, and value of hydrology and nitrogen dynamics for learning.

Disagreement with proposition that SGS Model is too confusing.

Questions 9-10



Agreement that linking to published literature would assist student learning.

Agreement that there may be benefits to learning by constraining the model options so that it is not too confusing for undergraduates.

In addition, it was recognised that the ability to explore fundamental processes – eg. change CO_2 concentration – was a valuable feature.

5 Success in Achieving Objectives

The objectives of this project have been met fully. The proof of concept shows that the model works in a thin client environment and that, according to both students and lecturers, it is of great potential use in the higher education sector.

6 Impact on Meat and Livestock Industry – now & in five years time

This concept proving project by itself has had little impact on the meat and livestock industry. However, it is clear that there are great opportunities for training the trainer in the higher education sector and thence to training a large number of undergraduates, many of whom will become the future advisers and consultants over the next 5 years.

If this concept were 'rolled out' on a larger scale, perhaps in conjunction with the DEST project referred to above, it would act as a catalyst for change by affecting future consultants' understanding of challenging concepts such as sustainability. The flow-on effects from this greater understanding are likely to be large for the 'public good' aspects of advice to farmers.

7 Conclusions and Recommendations

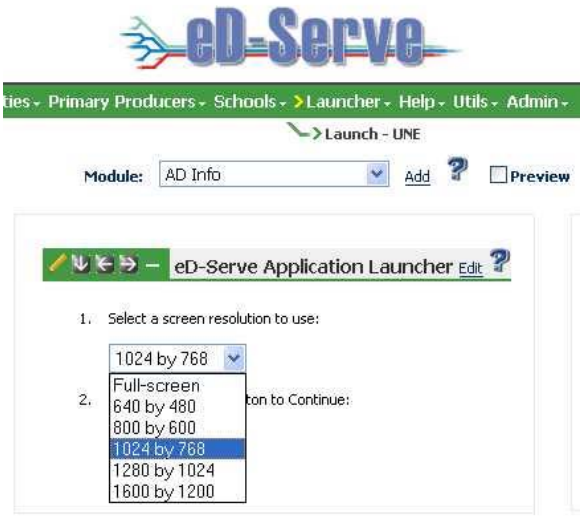
The concept of using the SGS Pasture Model for teaching using a thin client distribution system proved to be successful.

It is recommended that MLA explore with partner R&D Corporations and other collaborators such as educational institutions ways in which the use of such tools can be applied more broadly throughout undergraduate education to build the problem-solving capacity of future farm advisers.

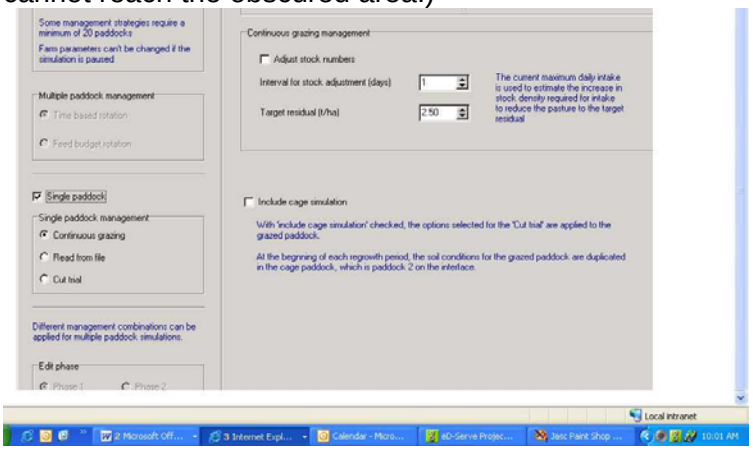
8 Appendices

8.1 Appendix 1 – Using the SGS Model on eD-Serve

When logging on to the eD-Serve Application Launcher, be sure to choose a screen resolution at least 1024x768.



(Choosing smaller than this (i.e. 800x600 will obscure some to the SGS interface and the scroll bars cannot reach the obscured area.)



Note that the scroll bar has terminated before the interface screen is fully displayed.

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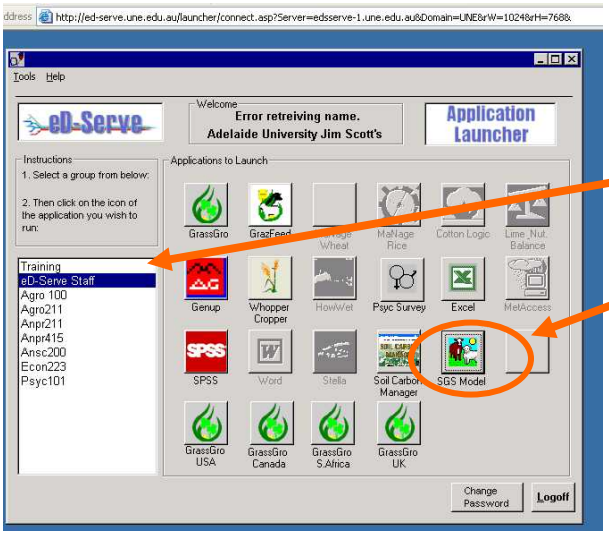
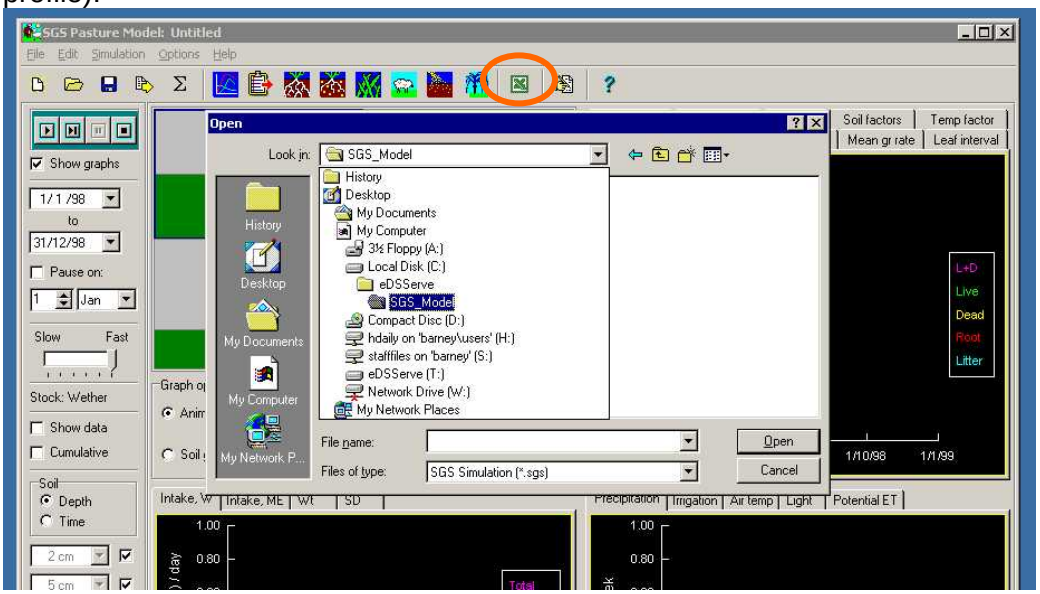
Enter your username and password for the Application Launcher, as you would if you were using GrassGro, GrazFeed, Whopper Cropper etc.

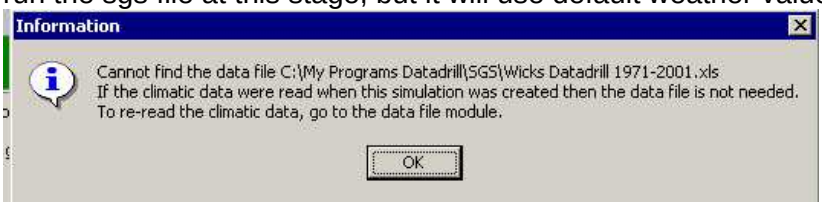


Select the eD-Serve Staff group, and click on the SGS Icon.

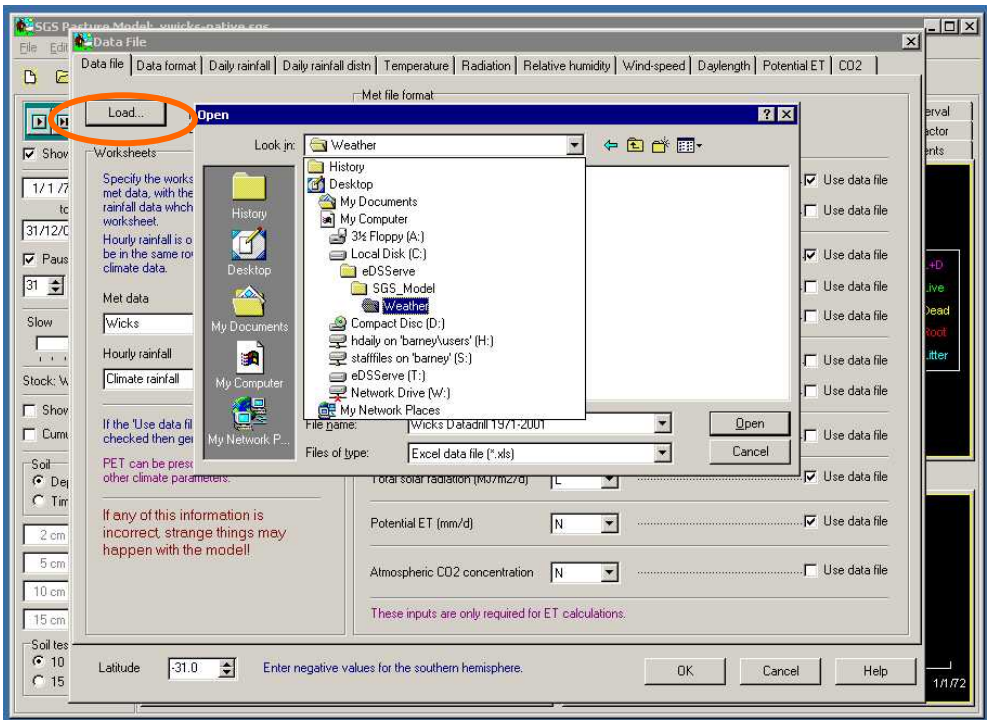
Open the SGS simulation file. Navigate to C Local Drive / eDSServe / SGS_Model and click on the file you require. (If you have previously used an SGS file then it will be already available in your profile).



This will load the file into your profile, but will not automatically bring the appropriate weather file with it. An error message will result saying that SGS cannot find the weather data file. (Note, you can still run the sgs file at this stage, but it will use default weather values.)

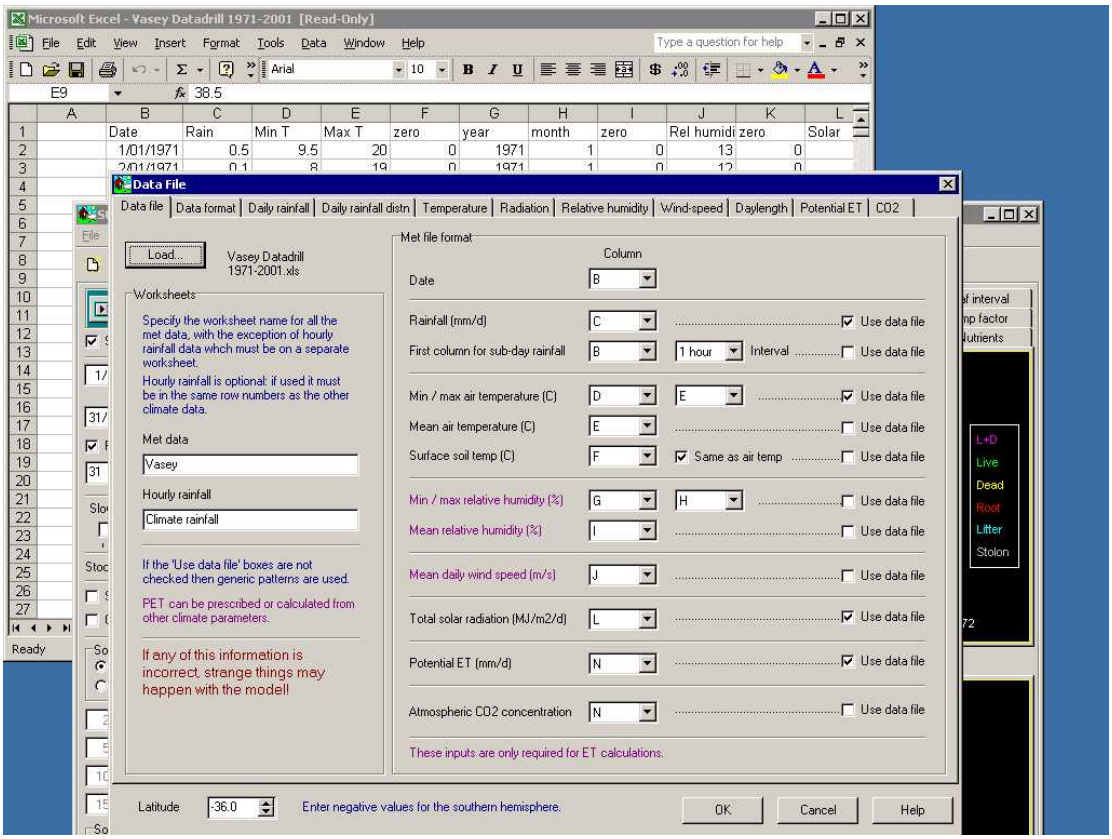


To load the correct weather, click on the MS Excel Icon on the SGS Toolbar, circled in orange above. Click on the Load Button, and you should automatically be directed to the Weather files for SGS.



Choose the appropriate weather file. The weather data file will automatically be opened in an Excel spreadsheet behind the SGS Model. Note that if you investigate this spreadsheet, it will be brought to the front of the interface, thereby obscuring the SGS Pasture Model. You will need to minimize Excel in order to return to the SGS Pasture Model.

You should also check that the columns in the spreadsheet match those required in the Data file inputs of SGS. Note that only those with the “Use data file” box ticked are required. So in the following graphic, SGS requires the Date to be in Column B of the Spreadsheet, Rainfall in C, Min and Max Temperature in D and E, respectively.



Click OK when you are satisfied that the Model will read the spreadsheet correctly. Then you can run the SGS Model.