Daisy Newsletter no. 2

The first Daisy Newsletter generated some enthusiastic and supportive mails which indicate that we have taken the first steps down a good path. However, we would like to hear the views of more people, so the questions have been included once more at the end of this newsletter. We are still very interested in receiving your citations on Daisy-related work from 2011 onwards in order to make them available to other Daisy users. Small summaries of your work and experiences will also be appreciated.

The code will be migrated to new platform

The server from which Daisy is presently downloaded will be discontinued this year, and the code will have to be moved. We will inform you about the changes through this Newsletter and provide a link to the new site on
http://plen.ku.dk/english/research/env_chem_phys/agrohydrology/

Meanwhile, the current is still daisy-model.org. Note that many 64-bit versions of Daisy have been produced the last year, and can be found on there, but sadly without proper release notes. The last 32-bit version of Daisy is still 5.19. We hope to resume creating 32-bit versions (and release notes) once the new home page is up and running.

Recent work "at home" with Daisy

How fast does fertilizer dissolve?

Chr. H. Christensen defended his MSc. Degree early this year on the topic of yield losses as a function of the Danish N-norms. The work highlighted a small problem in Daisy that we have not recognized before. Fertilizer was applied to the winter wheat in increasing doses in order to describe yield as a function of fertilizer input, 50 kg N in march and the rest in mid-April. None of the experiments showed any yield increase with above 150 kg N, which Daisy could simulate in a water-restricted experiment, but not in the other experiments. However, the 2nd dose of fertilizer was applied in the beginning of a dry period, and the first real rain came 2 ½ week after fertilizer application, which probably meant that the plants did not obtain the full benefit of the second application. Within the dry period, about 2 mm of rain fell, and as Daisy dissolves the fertilizer in the rain, the virtual plants ended up being better fertilized than the real plants, obviously during a very sensitive period.

Does early sowing of winter wheat decrease leaching?

The Danish Environmental Protection Agency asked us to perform scenario analyses of the effect of early sowing of winter wheat on N-leaching. To this end we had a close look at the first part of the growth curve of winter wheat, testing the seed based description of emergence [seed release], dry matter production and N-uptake against experimental data. It was possible to simulate the experimental data well, and the simulations on growth and N-uptake were very close to a wider collection of experimental results. Most experiments, however, show increased uptake of N during autumn, but no increased harvest of N, so the big question was what happens to leaching, and very little data was available on that. The result showed reduced leaching and a higher N-percentage in the material returning to the soil, leading to a slightly bigger organic pool of C and N. Only with somewhat higher N-content in the soil could we obtain a yield increase as well as the initial uptake. The study is at present only available in Danish
http://www.diku.dk/english/staff/vip/?pure=files%2F136714704%2FNotat_tidl_s_n_4v3.pdf

Recent work by others

The use of computer simulation models in precision nutrient management, by F. Plauborg, K. Manevski, Z. Zhou and M.N. Andersen.

Finn Plauborg from Aarhus University presented a study of the use of Daisy in precision agriculture recently at the 10th European Precision Agriculture Conference in Tel Aviv, Israel. He concluded that Daisy is quite sensitive to parameterisation of hydraulic properties, and to the C/N-parameters, especially the humus percentage and the depth of the topsoil. Daisy simulated the dry matter yield and the N-uptake in potatoes quite well, based on one set of hydraulic and C/N-parameters. Soil mapping combined with the use

of the Daisy model (or similar) therefore shows great potential for PNM, especially if spatial variation in topsoil depth and soil carbon content can be assessed and introduced into the model.

However, simulation models needs to be compared to reality continuously and it is necessary to consider how to correct simulations if simulations differ from reality. Different types of data assimilation and auto re-calibration may be a way forward here.

Use of Daisy to simulate forest trees

Some of the articles/reports listed below concerns the use of Daisy for simulation of Spruce and Beech forest as a means to manipulate groundwater recharge. Groundwater recharge appears to differ considerably depending on the tree species used for afforestation.

Assessment of traficcability and workability

G.Edwards he has used Daisy to simulate soil water content in order to evaluate traficcability and workability, bringing modelling close to practical use.

Agro-ecological zoning

Beyer et al. have used Daisy to analyze impact of rainfall characteristics across Upper Zambezi River. They find total rainfall to be a poor indicator of yield, and use the model to identify better indicators, such as length of the rainy season, dry spell frequency and maximum dry/wet duration, thus providing an improved basis for agro-ecological zoning.

Recent articles and reports where Daisy was used:

Salazar, O., Hansen, S., Abrahamsen, P., Hansen, K. and Gundersen, P. (2013): Changes in soil water balance following afforestation of former arable soils in Denmark as evaluated using the Daisy model. Journal of Hydrology, 484: 128-139.

Sonnenborg, T.O., Christiansen, J.R., Gundersen, P. (2014). Mere vand fra skove. Naturstyrelsen. 109 p. http://naturstyrelsen.dk/media/138885/mere-vand-fra-skove-rapport.pdf.

NB: The report has an English summary and part of the content is written as articles. The first article contains parameterization of spruce and beech:

Sonnenborg et al. 2014a. Modeling of canopy interception, throughfall and groundwaterrecharge in Norway spruce, beech and agricultural crops.

Sonnenborg et al. 2014b. Modeling of afforestation in a sandy and a clayey catchment: impact of forest type and coverage on groundwater resources.

Beyer, M., Wallner, M., Bahlmann, L., Thiemig, V., Dietrich, J. and Billib, M. (2014):'Rainfall characteristics and their implications for rain-fed agriculture: a case study in the Upper Zambezi River Basin.' Hydrological Sciences Journal. DOI: 10.1080/02626667.2014.983519.

Edwards, G.T.C. (2015) : Field Readiness and Operation Scheduling. Thesis from Department of Engineering, Aarhus University, Denmark. 178 pp.

NB : Chapter 3 and 5 includes Daisy modelling. Articles are on the way.

What would you like us to do?

We would like to know your opinion on how we can maintain better contact with Daisy users and provide better service in the future. You can help us by answering the questions below:

1. Would you like to receive a newsletter at regular intervals, including references, information about new features and perhaps experience from case studies?
2. Earlier on we have organised meetings once or twice per year where Danish modellers could discuss common problems and ideas. Would this be of interest to you?
3. Would you be interested in E-learning modules on aspects of Daisy use available on-line?
4. Would you be willing to pay a (reasonable) fee to access an on-line course on the use of Daisy for a particular purpose? (For example basic simulations of nitrate, pesticide leaching with and without macropores, use of the 2-D Daisy model or similar?)
5. Would you like to participate in a short (1-2 days) workshop on Daisy-use?
6. Other suggestions?

Please send your opinion to: styczen@plen.ku.dk.