Forecast of herbage production under continuous grazing

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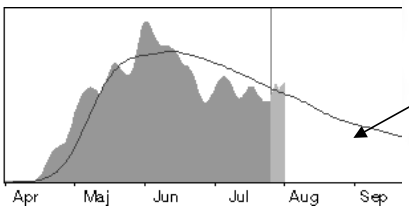
Keywords: forecast, grazing, grass/clover, growth rate

Introduction The utilization of pasture is very sensitive to oscillations in herbage growth. The farmer's daily planning involves decisions on pasture use as well as on the amount and composition of supplement feeding. In this planning, expected daily growth rate is an important factor. Often the knowledge and experience about the growth rate is first available after changes in management should have been made. A different growth rate than expected should lead to changes in the grazing area or in the supplement feeding. Therefore, a simple model of grass/clover growth under grazing and irrigated conditions was developed. From spring 2004, the model was used to compute a forecast of grass/clover growth, which has been available to Danish farmers and advisors in the online crop information system PlanteInfo (for a version in English, see planteinfo.dk/english).

Materials and methods A model for grass/clover growth was developed based on existing data from grazing experiments with dairy cows on research stations and private farms in Denmark. The model uses solely climatic information as driving parameters. The experimental data represent a wide range of N-rates, clover contents, soil types etc. These conditions were quantified and the growth was described depending on general N-level, leaf area index (LAI), phenological development, radiation and temperature:
$\Delta = \varepsilon f(T)g(I)h(N)i(T_{sum})$ where f(T) is a function of temperature, g(I) is a standard function of radiation and LAI, h(N) a linear function of N-level and i(T_{sum}) describe the physiological development of the grass/clover.

Results Under Danish conditions, LAI in continuous grazed pastures on farms is between 0.6 and 2.3, and therefore the grazing pressure will affect the growth rate very much. Other parameters such as sward composition and age, soil type, fertilization rate and distribution throughout the season further affect the growth rate in the individual field. Therefore, it was decided not to estimate the growth for the individual field, but to estimate the growth rate under fixed conditions (LAI, N-rate, clover content and drought stress) and to show the growth in relative terms. The forecasted growth could then be used in relation to the knowledge about the normal growth in a certain pasture. An increase in the predicted growth rate could for example result in lesser amounts of supplement feed or changes in the pasture area. The web page is shown in figure 1. The line is the mean growth rate over 10 years based on the model. The dark area is the growth rate until the current day calculated by the growth model, and the light area is the herbage growth for the coming seven days based on the weather forecast. Further information about the increase/decrease in the forecast week in relation to the last week is shown. In this situation there is prognosticated 14% increase. The predicted growth rate in 2004 was validated against results from trial plots, which confirmed the growth curve for 2004.

The forecast for 27th July 2004:



The web page for 27th July:

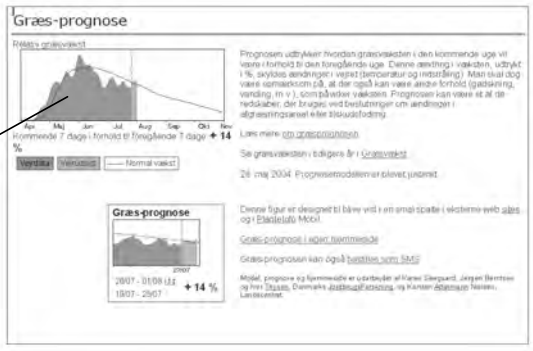


Figure 1 Copy of the web page for 'grass growth prognosis'

Conclusions It is planned to extend the forecast with herbage quality parameters. The work in 2005 will focus on water-soluble carbohydrates and crude protein especially in spring and early summer.