

Instructions for AgMIP Calibration activity

Phase 2 CSIRO (“usual approach” to phenology calibration with the CSIRO data set)

9 August 2018

Introduction to calibration: Phase 2 CSIRO

The aim of this exercise is to compare calibration approaches and simulation results for the prediction of wheat phenology, where all models are provided the same data for calibration (the “training data”) and each modeling group uses their “usual” method of calibration. This is similar to step 1 (data from France), but the data set is different and in particular has a very different structure, with many observed phenological stages.

A first objective is to explore in detail the different approaches to phenology calibration, with respect to five major questions: choice of parameters to estimate, upper and lower limits on parameter values (or more general prior information), goodness of fit criterion for calibration, method of taking into account multiple observed variables and method of obtaining uncertainty information. This will be compared with approaches used for step 1, in order to explore how data structure impacts calibration approach.

A second objective is to quantify the variability in performance (goodness-of-fit and prediction error) and to explore if that is related to the calibration approach.

This is a model + calibration-approach comparison. It is quite different than the model comparison exercises done previously in other AgMIP groups, in that emphasis is on the calibration approach more than on the models, a substantial and realistic amount of training data is provided, and evaluation is done using data which have neither site nor year in common with the training data, giving true independence between model errors for the training data and the evaluation data.

The full data set (training data and evaluation data) is from varietal tests in Australia. The prediction exercise is of practical interest; the question is to what extent models can predict phenology in new locations and years, given a reasonable amount of training data.

In this phase, modeling groups use their “usual” method of calibration. In subsequent phases, all groups will be asked to apply the same calibration approach. We will look at both a frequentist and a Bayesian approach. The approaches used in this first step will help define the approaches to test subsequently.

General dataset information

The data were provided by CSIRO Australia. These are phenology data for one variety of spring wheat in Australia, for 10 sites and three years and multiple planting dates (altogether 66 environments, where an environment is a combination of site and planting date).

The measured data is quite different than in step 1 (the French data set). Here, the Zadoks development stage was observed at several fixed dates for each environment. Observations were made about once a week. We have interpolated the data to give the date of every integer Zadoks stage from the first to the last stage observed. For example, if at the first observation date the Zadoks stage was 13 and at the last date it was 85, then the file has dates for every Zadoks stage from 13 to 85. Below Zadoks 13 and above Zadoks 85, the file has NA. Each modeling group can use whatever data is useful for them. It is expected that different groups will use different pieces of the data.

You are provided with measured results for only a subset of the environments (the training data). The results for the other environments (the evaluation data) will be used as a blind evaluation. This includes cases where neither the year nor the site is included in the training data, to ensure independence in model errors between the training and evaluation environments.

What you are requested to do

You are requested to estimate the parameters of your phenology model using the training data provided. Use your usual approach to calibration of phenology. If you habitually use various methods, choose the method you believe will give the best results. Pretend that you are furnishing results to a client who needs the predictions.

You are requested to furnish 2 files with results.

1. Using your estimated parameters, calculate dates for stages Zadok = 10 (emergence), 30 (ear 1 cm), 65 (anthesis halfway) and 90 (maturity) for all the environments (the environments of the training data and of the evaluation data).
2. Fill out the questionnaire as to how you did the calibration

The files attached here

- The file “19_04_2018 NVT 2010-2012 Soil and Management information.xlsx” has soil and management information for each site and sowing date. Note that site plus sowing date is the unique identifier.
- The file “Additional information about the experiments that might be helpful to some groups” has additional information.
- The weather data for each site and year are in a separate file, with self-explanatory names like “Turretfield2011.met” for the met data for Turretfield in 2011.
- The observed data are in the file “training Zadoks dates”, which you can open with Excel. There is one row per environment (so 66 rows of data, plus a header). Each row has 103 columns, with year, site, sowing day and then days after sowing for Zadok stages 1 to 100. Most of the data is missing. First, because only the training environments have values. The evaluation environments have all NAs. Furthermore, the training environments only have values between the first and the last observed Zadok stages. No extrapolation was done outside these values.

- The file “cal2CSIRO_results numerical modelName_contactPerson” will contain your simulated results for the 66 environments, for dates of Zadok stages 10, 30, 65 and 90.
- The file “cal2CSIRO_results explanation modelName_contactPerson” will contain the description of what you did.

Template for results

Please follow the attached template (file “cal2CSIRO_results numerical modelName_contactPerson.txt”) in furnishing your results. Please furnish simulated results for all environments. When you upload your results, in the name of the results file replace modelName by the name of your model, and contactPerson by the name of the contactPerson. Please put “NA”s for any results not simulated.

Please upload the zipped data with the name <NAME_MODEL> (e.g. Smith_APSIM) by September, 30th 2018 to the following folder: [link](#) Password: PIMGA

Explanation of calibration procedure

Please answer the questions in the file “cal2CSIRO_results explanation modelName_contactPerson.docx”. When you send your results, in the name of the explanation file replace modelName by the name of your model, and contactPerson by the name of the contactPerson.

Training and evaluation data

site\ year	2010	2011	2012
Bungunya			3
Corrigin	3	3	3
Eradu	3	3	3
LakeBolac	3	3	
Minnipa	3	3	3
Nangwee			3
SpringRidge	3	3	
Temora		3	3
Turretfield		3	3
Walpeup	3	3	3

The numbers are the number of sowing dates for the given site and year. Sites and years with red lines through them are for evaluation. Rest of environments are for training. Primary evaluation data, with red, numbers, are for 2012 for Bungunya, Corrigin, Nangwee, Temora, Turretfield and Walpeup, which have neither site nor year in common with training data. Secondary evaluation data are in blue.