

Prediction of Growing Season and Crop Yields in Southern Australia

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The average annual value of Australia's wheat, barley, oats and other grain crops in the years 1991/1992 to 1993/1994 was \$A 11, 400 million. Further addition of livestock products raises the total to \$A 23, 229 million.

Australian researchers have found that the best three years in a decade account for 70 to 80% of the profit made in a decade of wheat growing. The opposite is probably true, namely, "most of the farming losses are likely to occur in the worst three years in any decade". In this continent of high rainfall variability much is to be gained from the development of accurate and reliable rainfall and crop yield forecasting models.

Most research into long and medium range forecasting, and winter crop yield forecasting in Australia has focused on the El Nino/ Southern Oscillation. The Southern Oscillation Index (SOI) has been found to be of limited use in southern Australia for rainfall forecasting in the critical April to October cereal crop growing season. In southern Australia during this period one of the more common rain mechanisms is the general uplift in "northwest cloudbands" ahead of cold frontal zones.

The generation of these cloudbands appears dependant on sea surface temperature levels and gradients in the northeast Indian Ocean; the effect of these cloudbands seems to be dependant on the presence and strength of a major longwave trough of low pressure in the middle and upper atmosphere over or just to the west of the Australian continent.

These two major factors (of sea surface temperature in the north-eastern Indian Ocean and the presence and strength of the major seasonal longwave trough in middle and upper levels of the atmosphere over or just west of the Australian continent) are directly or indirectly measured in the input data to Holton forecasting computer models.

These forecasting models have been developed and tested over the past six months with funds provided by the Lands and Water Resource's Research and Development Corporation, under it's National Climate Variability Program; and was completed with the co-operation of the South Australian Research and Development Institute and the Bureau of Meteorology. The results of testing show that the Holton Models produce accurate forecasts of growing season rainfall, seasonal rainfall, and wheat crop yields over much of southern Australia.

The models are particularly accurate over the crop growing regions of South Australia, Victoria and parts of southern New South Wales. Accuracy levels are shown by the model correlations of 0.7 to over 0.9 (on a scale of 0 to 1) over most of the areas just mentioned. Some of these forecasting models are available for use in November the year prior to the coming growing season, while updated forecasting models using later information are available in April, May and June of the current growing season.

In layman's terms these figures show that the models have great potential for helping farmers make their important cropping decisions such as fertiliser amount, area to be cropped, choice of cultivation technique, and choice of crop and seed variety to be sown well before the growing season commences each year. Farmers therefore have the potential to make large grain yield increases in good cropping years, and to reduce significantly losses in bad cropping years.

The forecasting models also have potential to significantly improve production levels in other agricultural, pastoral and horticultural industries.

Updates of the Holton model can be found in the monthly BCDS Bulletins sent to BCDS members and sponsors.

Remember: BCDS Field Day - 17th September