PROSPECTS FOR BETTER SEASONAL FORECASTS

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OVERVIEW

Over the last six or seven years, seasonal forecasts provided by the Bureau of Meteorology's National Climate Centre have been based on statistical relationships between rainfall and the El Nino-Southern Oscillation (ENSO) phenomenon. The Southern Oscillation Index (SOI), a measure of the atmospheric pressure differences between Darwin and Tahiti, has been used extensively as an indicator of ENSO events. Significant correlations with the SOI, however, are limited to certain seasons and locations only, and strong relationships are often only found once an ENSO event is well developed. In particular, correlations over the period from late spring to early autumn in the cotton growing areas of eastern Australia are generally quite poor. Forecasts have also been restricted to 3 month seasonal average values commencing immediately from the time of issue.

Some improvements in statistical techniques using trend and phase information has extended the use of SOI based forecasts to provide coverage for most of the year round, and useful assessments of overall conditions are provided, but for cotton growing areas the skill has not increased to the point of bulletproof reliability. What then can be expected in the future?

IDENTIFIED NEEDS

There is an obvious need for greater accuracy and reliability from forecasts. There is a need also for greater flexibility and diversity in the types of forecasts provided to growers. Forecasts of the overall growing season conditions out to a year ahead are required for the medium to longer term planning of infrastructure development, such as the sinking of bores and dam construction for water supply and storage in anticipated dry years. Long lead time assessments of the next growing season's potential in conjunction with commodity price forecasts from agencies such as ABARE may be used to reduce risk by establishing forward contract hedges against market fluctuations when seasonal conditions appear adverse.

Anticipated oversupply and reduced intenational demand based on good growing seasons in other cotton producing areas of the world can seriously affect prices. Rainfall in the Mississippi basin in the US for example has a well known relationship with ENSO induced pressure patterns over the North Pacific and North America, and thus the global effects of ENSO can impact on the local market.

Shorter term forecasts on time-scales from one to two months ahead and of other climate variables like temperature, cloud cover and humidity are also needed to plan around the critical times of planting, spraying and harvesting. Much of the planning of day to day and week to week activities is contingent on prevailing climate conditions and the likelihood of certain events occurring on the shorter time-scale. For example, if there is an indication of a low probability of good rainfall in the two months leading up to planting there may be a need to pre-irrigate. Should the grower plant early or wait for a good rain event when it is expected there may be such an event in the coming month? Will there be sufficient solar radiation during ripening to provide high yields?

ADDRESSING THE PROBLEM

The Bureau's Research Centre is making progress in developing more sophisticated statistical models based on indicators of the state of the climate system other than the SOI. Global analyses of sea-surface temperature patterns over the last several decades are showing promising signs for skilled forecasts of both rainfall and temperature. Similarly, in the National Climate Centre, work has been undertaken to investigate atmospheric circulation patterns on a hemispheric scale and indices derived which show promise of extending forecast skill through the summer and early autumn period.

Results of a ten year international research program centred on the interactions between the tropical oceans and global atmospheric behaviour is now bearing fruit in the better understanding of the climate dynamics driving ENSO. Numerical computer models of the ocean-atmosphere system are providing skill at anticipating ENSO event development up to 12 months ahead.

At the shorter time-scale also, the dynamics asociated with the intraseasonal oscillation or "30 to 60 day wave" which markedly affects the timing and frequency of rainfall events over tropical and subtropical areas during the summer half year is becoming better understood.

Empirical analysis and numerical modelling efforts are also being directed at finding ways to predict extreme weather events such as floods, the timing of seasonal onsets or "breaks", and phenomena such as hail and frost at longer lead times.

Plans are well advanced for the establishment of an international research institute for climate prediction, sponsored by the US Dept. of Commerce through NOAA, and the Bureau is expected to be closely involved at a regional and international level.

BETTER MANAGEMENT WITH CLIMATE INFORMATION

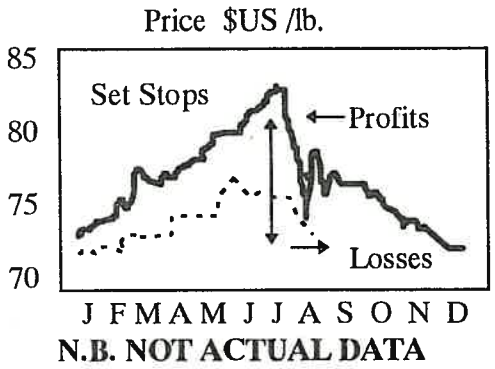
The accompanying schematic illustrates ways in which planned improvements in seasonal climate outlooks may be used in decision making for risk management.

SCHEMATIC

SEASONAL FORECAST RISK MANAGEMENT

12 MONTH LEAD

Estimate overall seasonal conditions
Assessment of next season's potential ENSO?
Rainfall deficit?
Ensure water storages & supply
Develop infrastructure
Hedge markets?

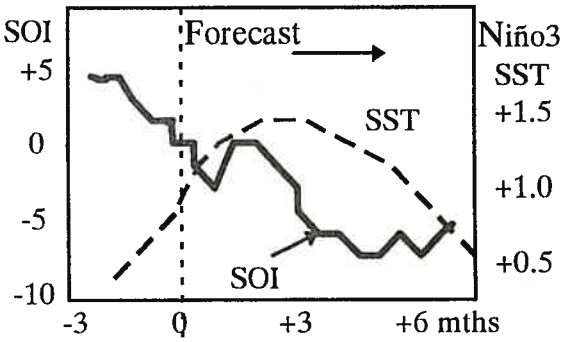


6 MONTH LEAD

Review coming growing season asessments. Complete infrastructure development. Modify strategies on basis of latest assessment. Field preparation, potential cultivar selection. Crop rotation? Markets.

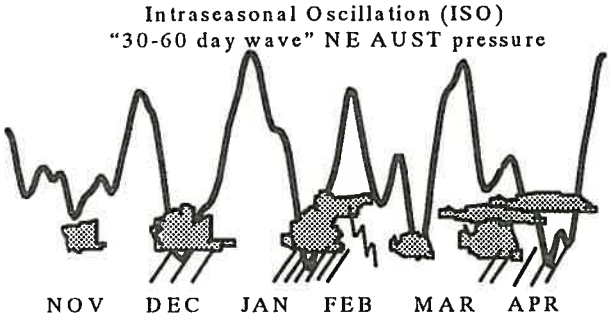
3 MONTH LEAD

Pre-season
-- Rain Deficit
-- Water Storages
-- Soil Moisture
-- Soil Temperature



2 MONTH LEAD

Timing and frequency of Intraseasonal Oscillation ("30 - 60 day wave").
Probability of timing of next major rain event. Plan activities around rain events
Pre-irrigate? Plant early or hold off?
Timing of Harvest.



1 MONTH LEAD

Planting. Fertilising. Spraying. Harvesting .Timing of ISO - last/next rain event. Probabilities of extreme phenomena - Frost, hail, flood, fire. Cloud cover, humidity wind.

Seasonal Outlooks updated monthly .
World wide web site- http://www.bom.gov.au/climate/
or from National Climate Centre, Box 1289K Melbourne, VIC. 3000.