Inquiry into the impact of climate change on Queensland agricultural production

Submission No:	12
Submitted by:	JCU Agriculture Technology and Adoption Centre
Publication:	
Attachments:	
Submitter Comments:	

Submission prepared by Professor Yvette Everingham on behalf of the JCU Agriculture, Technology and Adoption Centre

Inquiry into the impact of climate change on Queensland agricultural production - Queensland Parliamentary Inquiry

August 2023

Climate Variability and Climate Change is a key driver of sugarcane systems in Queensland and globally. A summary of the impacts has been provided along with a list of opportunities for consideration.

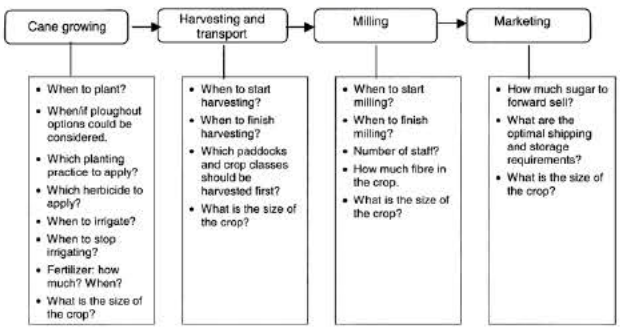
<table>
<tr><th colspan="2">Impacts of Climate Variability on Sugarcane in Queensland</th></tr>
<tr><td>EVERINGHAM Y, MUCHOW R, STONE R, INMAN-BAMBER N, SINGELS A, BEZUIDENHOUT C (2002) Enhanced risk management and decision-making capability across the sugar industry value chain based on seasonal climate forecasts. Agricultural Systems, 74:459-477.</td><td>Climate is a key driver of sugarcane systems in Queensland. It effects a range of tactical and strategic decisions that are made across the industry value chain of farming, harvesting, transport, milling, marketing and shipping.


Fig. 1. The industry value chain and key decisions influenced by seasonal climate forecasts.</td></tr>
<tr><td>INMAN-BAMBER N, EVERINGHAM Y, MUCHOW R (2001). Modelling water stress response in sugarcane: Validation and application of the APSIM-Sugarcane model. Proc. 10th Aust. Agron. Conf. (http://www.regional.org.au/au/asa/2001/6/d/inmanbamber.htm)</td><td>Model simulations showed that irrigation needed to be applied earlier in Bundaberg crops than in non El Nino years.</td></tr>
</table>

ANTONY G, EVERINGHAM Y, SMITH D (2002) Financial Benefits From Using Climate Forecasting - A Case Study. Proc. Aust. Soc. Sugar Cane Technol. 24:153-159.	Seasonal climate forecasts could have saved industry $1.7 M AUD against the devasting 1998 La Nina.
EVERINGHAM Y, MUCHOW R, STONE R, COOMANS D (2003) Enhancing Sugarcane Yield Forecasting Capability Using SOI Phases: A Case Study for North Eastern Australia. International Journal of Climatology, 23:1195-1210. EVERINGHAM Y, MUCHOW R, STONE R (2001) Forecasting Australian Sugar Yields Using Phases of the Southern Oscillation Index. Proceedings of the International Congress on Modelling and Simulation 4: 1781-1786.	Found that El Nino type conditions (negative SOI phases) favour below average yields in drier more southern sugarcane growing regions, but showed the opposite in the wet tropic cane growing regions. Eg in Tully El Nino years favour above average yields due to higher radiation in the summer growing season. The reverse is true for La Nina type conditions (positive SOI phases). That is La Nina conditions favour above average yields in southern cane growing regions and below average yields in northern cane growing regions.
EVERINGHAM Y, MUCHOW R, STONE R (2001) An assessment of the 5 phase SOI climate forecasting system to improve harvest management decisions. Proc. Aust. Soc. Sugar Cane Technol. 23: 44-50. SKOCAJ D, HURNEY A, INMAN-BAMBER N, SCHROEDER B, EVERINGHAM Y (2013) Modelling sugarcane yield response to applied nitrogen fertilizer in a wet tropical environment. Proc. Aust. Soc Sugar Cane Technol 34:101-109.	Discovered that disruption to the harvest season is more likely during La Nina years. La Nina years like 1998 and 2010 are well remembered by industry as very wet harvest years that caused soil compaction due to wet weather harvesting and this impeded the growth of future crop cycles and a substantial proportion of the crop could not be harvested due to wet boggy conditions.
EVERINGHAM Y, BAILLIE B, INMAN-BAMBER N, BAILLIE J (2008) Forecasting water allocations for canefarmers. Climate Research. 36:231-239.	The southern oscillation index was shown to influence streamflow in the Burnett River, which then influenced the water allocation for irrigation in the Bundaberg region, with less water being available in El Nino years and more water available in La Nina years.
BIGGS J, EVERINGHAM Y, SKOCAJ D, SCHROEDER B, SEXTON J, THORBURN P (2021) The potential for refining nitrogen fertiliser management through accounting for climate impacts: An exploratory study for the Tully region. Marine Pollution Bulletin 170, 112664	Shows that the optimal amount of simulated Nitrogen and Nitrogen losses varies with soil type, location, harvest time and rainfall amount.

Impacts of Climate Change on Sugarcane grown in Queensland

Note: Climate change research is outdated and should be performed with the latest climate change projection data. Findings were accurate at the time of the research, but the finding may not be accurate now.

SEXTON J, EVERINGHAM Y, TIMBAL B (2015) Harvest disruption projections for the Australian sugar industry. International journal of climate change strategies and management 7:41-57.	The number of unharvestable days is likely to change differently in different regions under climate change eg a decrease in the Burdekin and Bundaberg and an increase in the Herbert Region.
PARK S, CRIMP S, INMAN-BAMBER N, EVERINGHAM Y (2011) Sugarcane – In Adapting Agriculture to Climate Change, Preparing Australian Agriculture Forestry and Fisheries for the Future. Stokes C. and Howden M. (Eds.) CSIRO Publishing. pp 85-100.	In many sugarcane growing regions the amount of effective rainfall available to the crop will be reduced, while demand is likely to increase due to increased rates of evapotranspiration linked to atmospheric warming. A range of tactical and strategic adaptation strategies is needed if the industry is to remain sustainable under a changing climate. However, strategies must be location and decision specific.
Opportunities for the Queensland Government to create and support resilience, adaptation and mitigation measures in preparing the agricultural sector for future climate change.	
Technology adoption	Provide economically friendly ways to support farmers to purchase and install technologies that build climate resilience.
Skilled Technology Workers	Technology adoption will allow industry to build resilience, but it is difficult to attract technology skilled workers to regional areas.
Sustainable Finance	Build industry confidence and understanding in opportunities that sustainable finance can deliver producers. Support further research where appropriate.
Research Development & Adoption & Commercialisation	Support integrated R&D and Extension and Adoption and Commercialisation to enhance the uptake of true solutions that have been validated with proper scientific rigour.
Whole of systems modelling for both climate change and climate variability	Historically it has been easier to engage industry on climate variability than climate change. Consequently, more research has focussed on the impacts of year to year climate variability. There is a need however to perform whole of system modelling for historical and future climates (using the latest simulated future climates) to understand which options are likely to deliver more sustainable outcomes. Such modelling could also improve water management, which varieties would grow best and under which conditions, the suitability of land use change. Systems modelling could also inform policy makers and institutional change.