



**Rural R&D for Profit program
Final Report**

Improved use of seasonal forecasting to increase
farmer profitability



APPENDIX 9

Summary of further detailed discussions and workshops with northern Australian industry groups. Forecast systems now included.

EXAMPLE YEAR	EVENT	THRESHOLD	CLIMATE VARIABLE OF INTEREST	IMPACT OF EVENT	FORECAST REQUIRED	FORECAST AVAILABLE	NOTES
2017	Low spring / winter rain (< 6-8 mm)		Rainfall	Hard to manage.	Light rain in cooler months.	All forecast systems should have this capability in ENSO periods. Requires more skill in non-ENSO periods.	Practical industry response: stock up on supplements; keep grass at stage 2.
2016	100 mm rain during June-July.		Rainfall & Temperature.	Cold while raining (can cause mass animal death), then warm. Grass growth ↑ Protein/energy levels of pasture. ↑ animal production.		All forecast systems including POAMA 2.4 should have this capability.	
2016	40°C extreme heat during Nov – Dec.	50 mm over 1 week.	Rainfall & Temperature.	High calf losses.	At the start of wet season.	Long LT – All forecast systems should have this capability.	
2015	Early season rain during June – July.		Rainfall	Decision carrying capacity and pasture Budget.	October	6 months - All forecast systems should have this capability.	
2012	Cold & frost		Temperature	Animal production ↓, grass protein ↓.		Temperature forecasts available – but not frost!	

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1974, 2010 & 2011	Frost	Low min temperature, frost & rain.	Rainfall & Temperature.	Impact on grass quality.	JJA	Temperature forecasts available – but not frost!	Practical industry response: weaner management – early weaning or later weaning; remove weaners from yards.
2007	Rain, with low day & night temperatures during June.		Rainfall & Temperature.	Weaner losses.		1 week plus. ACCESS-S should have this capability.	
1992 - 1997	Drought		Rainfall	Ticks & bare patches.		New decadal forecasting systems should have this capability.	
1991	6 weeks rain		Rainfall	Grass – high quantity, low quality; Poor production; ticks; high fire risk; burnt areas got no growth for next 4 years of drought.	Length/quantity of rain. When 'wet' season stops.	ACCESS-S should have this capability.	Practical industry response: Plan for oncoming dry; Plan supplementation for wet season.
1983	Dry until 26 April then 21 days straight rain; wet & cold.		Rainfall & Temperature.	Cattle bogged; ticks; cattle loss.	ON	3 months – ACCESS-S should provide this need.	Practical industry response: Decision required to buy or sell.
1981	High rainfall for 3 weeks during January.		Rainfall	High calf mortality; weight loss; blow flies.	NDJFM	6 months – ACCESS-S should provide this more detailed information.	Practical industry response: Joining – 12 months Lead Time – management; Wean out of season calve; Postpone muster, don't wean; Spread cattle out.

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1981	30" rain during Jan – Feb; cold winter; 30 days frost.		Rainfall & Temperature.	Grass grew in abundance; Grass turned inedible; by August cattle were dying.		ACCESS-S should provide this more detailed information.
1974	1100 mm rain.	650 mm good amount of rain.	Rainfall	Cattle bogged; ticks; increase in chemical use; increase in operational costs.	DJF	3 months - ACCESS-S should provide this more detailed information.
YEARLY			Rainfall & Temperature.	Most important decision time.	MAM	Long Lead time. All forecast systems during ENSO periods, but would check GLOSEA5 Capability.
YEARLY	Break in onset of season.		Rainfall			ACCESS-S
YEARLY	High or low temperatures with high wind, frost.		Temperature, wind.	Negative impact on weaners; negative impact on grass growth.		7 days – ACCESS-S .
2009	Very dry; rain arrived in December.		Rainfall	Adjust stocking numbers.	SONDJF	6 months - All systems during ENSO periods. Practical industry response: If no rainfall by January, adjust stocking numbers.
YEARLY	Tropical cyclones	Intense rainfall	Rainfall	2/3 of stock moved to higher ground.	Nov-Apr	2 weeks - ACCESS-S .

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YEARLY	Floods		Rainfall	Can impact property without rain on property; can effect planting of crops; crop viability can be determined by temperature.		ACCESS-S	
YEARLY	Break in season rain; heatwave.	50 mm over 3 days.	Rainfall & Temperature.			ACCESS-S	Practical industry response: Planning for management decisions; plan for season break.
YEARLY	Frost/early frost; how often & area of prediction.	Below 0°C	Temperature		JJ	3 months - Not available unless statistical system using SOI phases used.	Practical industry response: Weaning; Protein supplements for breeders.
YEARLY	Droughts		Rainfall		DJF	3 months – all systems.	
YEARLY	Droughts		Rainfall	Decision regarding breeding, pregnancy testing and parturition.		2 months – ACCESS-S.	
2017	16 days of rain During October – Isis Mill & Bundaberg.		Rainfall	Disruption to harvesting for 16 days; damage to cane crops; damage to water and lodging plant. 3000 ha impacted = 8% cane area; plant cane root rot, fungal, bacterial diseases; Damage to infrastructure ISIS Mill \$250k on rail line and lost pumps.	Rainfall - Frost - Temperature Map specific to the location.	3 Months - Wet weather equipment preparation. 28 Days - Alter maintenance plan. 7 days - set maintenance day. 3 days - start building extra stock. Frost forecasting needs to be addressed.	Practical industry response: Longer time to harvest; harvest dry country; flexibility of rosters; budgeting for wet days; full track harvester; Spray for diseases before rain pumps on slides i.e. winches; banded pumps; Change in

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			1000 workers laid off mainly harvest i.e. transport			entitlements ie paid leave.
2017	Cyclone Debbie during March.	Rainfall	Infrastructure damage at Mill; Significant inundation; autumn plant cane 10% (5060 ha) of losses; 90% loss of soybeans – Isis. Positive outcomes include, filled water storages, good growth, mild winter, saved crop.	Rainfall - Frost - Temperature Map specific to the location.	3 months - adjust planting times. Increase or decrease area under fallow crop. 28 Days- firm up planting window. 7 Days - planting decisions Halt or Accelerate? Cease or slow down rate of irrigation. 3 Days - remove irrigation equipment, close gates, cease irrigation, move equipment to high ground.	Practical industry response: Bunding pumps; clean drains before rain.
2011, 2013, 2017	Floods in Bundaberg & Childers: 3 rainfall events, 40" in October.	Amount of rain plus number of wet days (50 mm over 3 days – depending on region).		Percentile approach for region.	Can be adjusted from current systems, but look to ACCESS-S for more detailed outputs.	Practical industry response: Sell less sugar (don't forward sell as much if wet forecast); Hitting CCS peak to maximise/crop yield estimate & timing harvesting; “reverse engineer”.
2014	750 mm for year, 300 mm in Nov Dec.	Rainfall			ACCESS-S should provide this more detailed information.	

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	July Frosts – 11 consecutive subzero days.	Temperature		Frost forecasting on a seasonal basis badly needed.	Practical industry response: Harvest or crush lower areas first.
2014	Dry	Temperature	Heatwave late Nov – Dec. Irrigated soybeans early based on heatwave forecast and saved soybean crop. Still ploughed in due to wet Jan.	ACCESS-S should provide this.	Practical industry response: More water required.
2010 / 2011	Wet harvest	Rainfall	Forward contracts not met; ↑stand over (10-40%); Impact on yields carries forward in subsequent years.	All systems can currently provide this.	Practical industry response: Compaction → Start earlier; → Disregard equity.
2008	Frost on 12 th of August.	Temperature	Killed all plant sources (planting material unavailable); June - July usual frost 'season'; Affected industry 3-4 years; loss of available planting (growing points) → look at yield data impact \$\$\$; Milling impact, sugarcane deteriorated → can't harvest fast enough – rotten cane; Losses McKay \$90 M; value of reducing water stress.	Seasonal forecasting for frost badly needed.	Practical industry response: Remedial action could have involved irrigation, cleaning seed all on one farm location, instigate protection measures / less prone to frost affect (identify site), water overnight when possible, remove trash blanket or direct harvesting to most at risk areas (also for excess rain/flood especially late in harvest season). In lower lying areas – often planted earlier more flood prone to ensure cane is higher

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2006 / 2007	Drought	Temperature	↑Temp → Irrigation Schedule ↓ 30% Shorten of years; ↓ Production; Establishment failure in spring ↓ temperature.	6 months - All systems can provide this.	Practical industry response: Change fallow, delay planting crops or go early.	
1998 - 2010	Prolonged, heavy, constant rainfall harvest period.	Rainfall	Number of wet days and rainfall amount- Jun-Nov (window) critical 1; Mar-Jun critical too; Nov year before harvest (realistic) marketers; 1 March year of harvest (farmers & millers); Reverse Engineering Concept 2010; Flow on effect subsequent years from these extremes → 5 years (impact on the crop cycle); Standover (crops not harvested); Crop failure (sugar plant & fallow crops); Increased disease levels, environmental losses; Community employment/cash flow.	Jun-Nov (window) critical; Mar-Jun critical.	12 months - Current systems can supply this	Practical industry response: Remedial action could have involved machinery modifications, manipulation of harvest time, prioritise harvest & planting, plan for standover, variety selection (harvest better crops first, location, variety selection), alter farming system & inputs, alter fallow management and revise forward selling strategies. Reverse Engineering concept: 1998 & 2010 were extreme years and caused a lot of devastation to the industry. The idea is to take the observed data from 1998 and 2010 for different sugarcane growing locations and develop a rule that identifies

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						these years as extreme and other years as non-extreme. I.e. use the data and work backwards.
1992	River flooding	Rainfall	High standover cane due to weather (vs compaction impacts); big impact of lack of supplementary irrigation; Crop establishment – CCS ↓ lack of germination, lack of crop vigour, stool death; Low Yields.	Likelihood of river overflows.	6 to 12 month 3 to 5 years - ACCESS-S and decadal forecasting.	Practical industry response: Management of water allocation – reserve to use late in season vs early strategic irrigation management Choices. Look at ENSO Signals.
1988	Total: 899 mm, with 300 mm rainfall in Dec.	Rainfall			All forecast systems could have provided this.	Practical industry response: Removal of irrigation equipment.
1988 / 1989	Drought	Rainfall & Temperature	327,000 tonnes of cane in Isis due to drought, poor quality, rain affected harvest.		None currently available.	Practical industry response: Delay start to crushing; ↑ winter temp → irrigate.
1977	Drought: June - Oct with 26 mm rain.	Rainfall	418,000 tonnes of cane crushed.		ACCESS-S	Practical industry response: Irrigation scheduling – where to use water.
YEARLY	Low/insufficient rainfall.	Rainfall			Climate change studies needed.	Practical industry response: Fear of drought in areas of supplementary irrigation. Management of dry

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					spring required to prevent failure to irrigate when they should - better to use rather than save for dry finish.
YEARLY	Low rainfall	Rainfall		Climate change studies needed.	Practical industry response: N fertiliser product choice & EEF \$ cost impacts urea.
YEARLY	Low rainfall in wet Tropics.	Rainfall	Positive impact on surplus of crops (except the Tablelands). Solar radiation limited in wet Tropics.	Climate change studies needed.	Practical industry response: Consider bringing crush forward (mill/harvest scheduling/forward selling crop).
YEARLY	Wet Tropics	Rainfall	Fertiliser impacts; Water quality impacts; pesticide choices.		
YEARLY	Central region	Rainfall			Practical industry response: Supplementary irrigation scheduling.
YEARLY	High rainfall - all regions.	Rainfall	Waterlogging/low yields and harvesting issues.		Practical industry response: Improve fertiliser choice.