Climate as a Natural Resource and its Importance to Cane and Sugar Production at two Mills in Fiji: An Overview.

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Sugar Industry

- **Mainstay** of Fiji’s economy
- High sugar prices of 70s
- Sugar production was the only major export
- “Tourism and export driven manufacturing sectors were established but sugar industry is the key to rural economy.”

Today, sugar industry contributes
- 7% GDP
- 22% of total export
- 8.5% of total foreign earnings
- provides employment - 51000 people
Climate: Resource

CLIMATE – valuable natural resource.

EXPOSED - climate variability or CONSIDER long term CC than only practical importance of climate information is recognized.

NATURAL RESOURCE- protected and adapted. Thus in the last 2 DECADES – interest in research dealing with CV & CC.

IPCC (2007) Report reveals GHGs emissions has warmed the climate system by 0.74 °C between 1906 to 2005.

Predictions for this century is likely increase 2- 4.5°C

MAGNITUDE of warming varies locally, warming trend is spatially widespread & consistent with other evidences.
Temp increase will be *accompanied by rising sea level*, salt water intrusion and large scale inundation of the coastal areas and more intense precipitation in some region and increased drought in others.

Such global CC will have adverse effect on agriculture, fresh water and marine ecosystems. “This is a major concern to sugar industry”

Sugar Industry recognises the impact of CV AND EXTREME EVENTS more often than many other sectors DUE TO THE IMPACT OF CYCLONES, FLOODS AND DROUGHTS ON CANE PRODUCTION

NEED to provide good forecasting system to the industry to change key management decision to mitigate adverse effect of climate.
Climate affects whole of the industry

Shipping arrangements

Storage

Planting

Harvesting & transportation

Milling

Start/ close maintenance
Sugarcane growth schedule

All management decisions have been developed in response to long term appreciation of climate.
Decisions based on climate information at the grower level

- **Land preparation** – after the wet spell, land needs to be dry for tractors to move in the field—April onward.

- **Seed-cane planting** – rain is necessary for good establishment of cane—April to May.

- **Herbicide and fertilizer efficiency** is improved if advance knowledge of weather is known depending on the herbicide or fertilizer used.
Decisions based on climate information for Millers

- **Mill opening and closing** – advanced knowledge helpful.
  
  High rainfall in May-June and low in December
  late opening late closing recommended

  Low rainfall in May-June and high in December
  early opening early closing recommended

- **Shipping arrangements** – good knowledge of possible weather conditions can assist in predicting sugar production and thus arrange for shipment in advance.
Factors influencing sucrose accumulation and cane production

**Water stress**: high water requirement – partially tolerant to drought. **Natural Ripening depends principally** – reduced moisture

**Nutrient stress**: lack of N late in the season, once maximum growth is achieved. (Alexander 1973)

**Temperature**: lowered temperatures, seems to be dominant factor (Innes & Cowan, 1960; Yates 1996a).
Temperature and sucrose (pocs)

- Leaf growth reduced -15 to 19°C, available photosynthesis is partitioned to sugar accumulation rather than vegetative growth. “Lowered Temp”

- A large range in “diurnal temperature” also favours sugar accumulation.

- Mean annual day degrees also has association with sugar accumulation.
Effect of mean annual minimum temperature on %pocs at Labasa Mill between 1961-2008

Minimum temperature and cane POCS for Labasa Mill from 1961 to 2008
Anomalies in max and min temperatures at Labasa mill

Trend in average annual day maximum anomalies at Labasa Mill from 1961 to 2008

\[ +\delta = 0.76 \]

Year

Trend in average annual day minimum anomalies at Labasa Mill from 1961 to 2008

\[ +\delta = 0.49 \]

\[ -\delta \]

Year

MI NI MUM

72-74 ??
Trends in number of days per year with minimum night temperatures exceeding 25° C at Rarawai and Labasa during the period 1961-2008

Rarawai Mill from 1961-2008

Labasa Mill from 1961-2008
Trends in number of days per year with minimum night temperatures lower than 18° C at Rarawai and Labasa during the period 1961-2008

Rarawai Mill from 1961 to 2008

Labasa Mill from 1961 to 2008
Diurnal Temperature Comparison between Rarawai & Labasa Mill

Year  | Rarawai Diurnal Temp | Labasa Diurnal Temp
--- | --- | ---
1961 | 11°C | 8°C
1962 | .. | ..
1963 | .. | ..
1964 | .. | ..
1965 | .. | ..
1966 | .. | ..
1967 | .. | ..
1968 | .. | ..
1969 | .. | ..
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2007 | .. | ..
2008 | .. | ..
Conclusion

• Value of climate as a resource is still not appreciated by many in the agricultural sector.
• Climate affects all aspects of sugar industry.
• Preliminary studies indicate that minimum night and diurnal temperatures may be affecting sugar production.
• Support is needed by tiny island states growers as they are most vulnerable to impact of CC.
Thank you

The way the World Should Go