Inquiry into the impact of climate change on Queensland agricultural production

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Mackay Conservation Group

The Environment Centre
156 Wood St, Mackay
PO Box 826
Mackay Qld 4740

Tel: (07) 4953 0808
Email: info@conservation.org.au
Web: www.mackayconservationgroup.org.au
ABN: 41 123 903 975

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Committee Secretary
State Development and Regional Industries Committee
Parliament House
George Street
Brisbane Qld 4000
Email: SDRIC@parliament.qld.gov.au

Submission to the State Development and Regional Industries Committee

Impacts of Climate Change and Climate Variability on Queensland Agricultural Production and Related Risks

Dear Committee Members

Mackay Conservation Group (MCG), an organisation devoted to promoting sustainable practices and addressing environmental challenges, presents this submission to discuss the impacts of climate change on Queensland's agricultural sector. MCG has maintained an interest in sustainable agriculture for decades. For example, MCG played a strong part in establishing the Nebo-Broadsound Landcare Group in the late 1980s to ensure that there was a connection between the agricultural sector and the conservation movement. Our members include current primary producers in both the grazing and sugar cane sectors.

MCG's interest in campaigning for policy and practice that prevents the damaging effects of climate change has existed alongside our interest in sustainable agriculture. Like others, we see climate change as the greatest risk facing humanity and other species on our planet. The impacts are already being felt by the agricultural sector.

1. IMPACTS OF CLIMATE CHANGE ON AGRICULTURAL PRODUCTION

Queensland's agricultural sector is already bearing the brunt of climate change and variability. Increased temperatures, shifting rainfall patterns and more frequent and intense extreme weather events — such as droughts, floods and heatwaves — are jeopardising the sector's productivity and profitability.

(a) Temperature Rise: Increasing temperatures due to climate change are particularly detrimental to both sugar cane production and cattle grazing in Central Queensland. For sugarcane, extreme heat can lead to a reduction in sucrose content and overall yield. One research project found that sugarcane production "will continue to be considerably affected by increases in the frequency and intensity of extreme environmental conditions due to climate change"[1]. Temperature change, especially rising minimum temperature, may lead to a decline in sucrose content of between 10% and 70% in rain watered crops or up to 37% in irrigated crops by 2040-2060[2]. According to the

[1] Kohila, S. & Gomathi, R., 2018, 'Adaptive physiological and biochemical response of sugarcane genotypes to high-temperature stress ', *Indian Journal of Plant Physiology*, vol 23 no.2, p. 246

[2] Shanthi, R.M., Alarmelu, S., Mahadeva Swamy, H.K., Lakshmi Pathy, T. (2022). Impact of Climate Change on Sucrose Synthesis in Sugarcane Varieties. In: Verma, K.K., Song, XP., Rajput, V.D., Solomon, S., Li, YR., Rao, G.P. (eds) Agro-industrial Perspectives on Sugarcane Production under Environmental Stress. Springer, Singapore.

Australian Bureau of Meteorology's ACORN data, the minimum temperature at Mackay has consistently trended higher, rising by about 1.58°C since 1970. Climate change can also hasten the maturation of sugar cane, leaving a smaller window for optimal harvest and potentially affecting the quality of the crop.

The rising temperatures associated with climate change present unique challenges for beef cattle grazing in Central Queensland. Prolonged heatwaves and consistently high temperatures can induce significant heat stress in beef cattle, especially in feedlots. Heat stress not only leads to animal death, it reduces the time cattle spend grazing and ruminating, leading to potential weight loss, but also disrupts normal reproductive cycles, reducing overall fertility rates.[3] In addition, increased temperatures may exacerbate the prevalence of certain diseases and pests, further impacting cattle health and productivity.[4] These factors combined may result in diminished beef production and decreased economic returns for farmers in the region.

(b) Altered Rainfall Patterns: Changes in precipitation, including shifts in the timing and intensity of rainfall, play a critical role in Central Queensland's agriculture. In sugar cane farming, irregular rainfall can disrupt the planting schedule and reduce available harvest times.[5] Moreover, changed rainfall patterns may negatively affect both plant growth and sucrose accumulation.[6]

For cattle grazing, both insufficient rainfall, leading to drought, and excessive rainfall, leading to flooding, are harmful. In recent years this region has experienced both record drought periods as well as unprecedented flooding.

(c) Extreme Weather Events: The increase in frequency and intensity of extreme weather events, such as cyclones, storms, heatwaves, and floods, will increasingly impact Central Queensland's agricultural industries. Cyclone Debbie led to life threatening rainfall of 350 to 450mm in six hours in parts of the region.[7] The impact on crops, livestock and infrastructure caused widespread disruption.[8]

For sugarcane, cyclones and storms can lead to significant crop loss by damaging the cane and disrupting the harvest. Furthermore, flooding can cause waterlogging and lead to an increase in pests and diseases, affecting the quality and yield of the sugar cane.

In the case of cattle grazing, severe storms and floods can lead to substantial loss of cattle, either directly through drowning or indirectly through the spread of water-borne diseases. These events also pose significant threats to farm infrastructure, including fencing, sheds, and water systems.

Understanding these impacts is crucial for the development and implementation of effective strategies to help agriculturalists in Central Queensland adapt to the changing climate conditions.

2. RISKS OF CLIMATE CHANGE ON THE SECTOR

Climate change poses immediate and future risks to Queensland's agricultural sector:

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[3] Gedda, S., grazier, Central Queensland, Personal Correspondence.

[4] Ali MZ, Carlile G, Giasuddin M., 2020, 'Impact of global climate change on livestock health: Bangladesh perspective', Open Veterinary Journal, vol 10 no.2, pp.178-188.

[5] Sexton, J., Everingham, Y. and Timbal, B. (2015), 'Harvest disruption projections for the Australian sugar industry', *International Journal of Climate Change Strategies and Management*, vol. 7 no. 1, pp.41-57

[6] Yu, Z., Diego Della, J., Yoriko, K., Jansle Vieira, R., Graziano, P.S. & Lamparelli, R., 2016, 'Dynamics modeling for sugar cane sucrose estimation using time series satellite imagery' in Neale, C. & Maltese, A. *Remote Sensing for Agriculture, Ecosystems, and Hydrology XVIII*, Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series

[7] Bureau of Meteorology, 2018, *Tropical Cyclone Debbie Technical Report*, Australian Government, Melbourne, p.22

[8] Dodd, Z., 2017, 'Cattle and crop losses emerging in Cyclone Debbie's wake', in *Courier Mail*, March 31, 2017, [online] https://www.couriermail.com.au/news/queensland/rockhampton/cattle-and-crop-losses-emerging-in-cyclone-debbies-wake/news-story/75610ff6df730cae2e04247ae93cadaa

(a) Economic Risks: The potential for reduced productivity in both sugar cane and cattle sectors due to climate change translates directly into economic losses. As noted previously, for sugar cane farmers, the loss of crop and lowered sucrose content due to extreme heat, altered rainfall, and increased frequency of severe weather events can lead to reduced production leading to reduced income. The disruption in planting and harvesting schedules due to unpredictable weather patterns can also increase production costs.

In the case of cattle grazing, heat stress on livestock can lead to decreased weight, lower beef production, and increased mortality, all resulting in significant income loss for farmers. Additionally, the costs of addressing drought impacts, like providing additional feed or water to livestock or mitigating health issues due to excessive heat or waterlogged conditions, could substantially increase operational costs. Goode et al (2021) say feedlots (and other industrial systems) “are generally based on high-yielding animals, which are more susceptible to heat stress, so require greater investment in infrastructure to insulate them from climate extremes [and] the close physical proximity of animals to each other and humans can increase the possibility of disease outbreaks”.[9]

(b) Food Security: Fluctuations in agricultural output due to climate change can disrupt local and regional food supply chains, leading to food security concerns. For sugar cane, reduced output can affect not only the local sugar supply but also other industries that rely on molasses, a byproduct of sugar production.

In the case of cattle grazing, reduced livestock productivity can lead to a decline in meat supply. Both these outcomes can have cascading effects on Queensland's and Australia's food security, potentially leading to increased food prices and reduced availability of certain food products as well as impacts on export income. As climate impacts become more obvious, the contribution of beef cattle production to greenhouse gas emissions is likely to negatively affect the social licence of the industry.[10]

(c) Biodiversity and Ecosystem Loss: Changes in temperature and rainfall patterns can also have significant impacts on biodiversity and ecosystem functions that support agriculture. In sugar cane plantations, changing climate conditions can alter the species composition of beneficial soil organisms.

For cattle grazing, the change in pasture quality and quantity due to extreme heat and drought can lead to shifts in the species composition of grasslands. This can negatively impact the grazing cattle as well as other species that rely on these habitats, leading to a potential loss of biodiversity.

Furthermore, increased frequency and intensity of extreme weather events, like floods, can lead to soil erosion and degradation[11], affecting the health of the ecosystem and its capacity to support agriculture in the long term.

Understanding and addressing these risks is critical to ensure the sustainable future of sugar cane production and cattle grazing in Central Queensland.

3. ROLE OF FOSSIL FUELS, PARTICULARLY COAL, IN EXACERBATING CLIMATE CHANGE

The extraction and burning of fossil fuels, especially coal in this region, are significant contributors to the global increase in greenhouse gas (GHG) emissions, which in turn leads to climate change. These GHGs trap heat within the Earth's atmosphere, leading to global warming and associated changes in climate patterns. Coal, being one of the most carbon-intensive fuels, has a significant role in exacerbating climate change.

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[9] Godde CM, Mason-D'Croz D, Mayberry DE, Thornton PK, Herrero M., (2021) ‘Impacts of climate change on the livestock food supply chain; a review of the evidence’, *Global Food Security* March 2021:100488, [online] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7938222/

[10] ibid

[11] Yang, X., ‘State and trends of hillslope erosion across New South Wales, Australia’, *CATENA* vol.186 March 2020, [online] https://www.sciencedirect.com/science/article/pii/S034181621930503X

For Central Queensland, a region with both extensive coal mining and vital agricultural industries such as sugar cane production and cattle grazing, the impacts of these coal-induced climate changes are particularly profound.

Sugar Cane: Rising temperatures, variable rainfall, and extreme weather events driven by climate change can significantly affect the growth and yield of sugar cane. Moreover, the energy-intensive nature of sugar cane processing means that the sector itself could be contributing to GHG emissions, particularly if the energy used is sourced from coal-based power. This not only exacerbates climate change but also risks making the industry less sustainable in the long term.

Cattle Grazing: The impacts of climate change on cattle grazing are manifold. Furthermore, the cattle industry is a significant contributor to GHG emissions, particularly methane, a potent greenhouse gas. Much of these emissions come from enteric fermentation in cattle. The continued reliance on fossil fuels for energy needs in agricultural operations, such as feed production and transportation, can contribute further to the industry's carbon footprint.

While the burning of coal for energy has underpinned much of Queensland's economic growth, it also poses a significant challenge for the region's agricultural sectors. The transition away from coal and other fossil fuels towards more sustainable energy sources is therefore not just an environmental imperative, but also a necessity for the long-term viability of these agricultural industries.

4. OPPORTUNITIES FOR RESILIENCE, ADAPTATION, AND MITIGATION

MCG urges the Queensland Government to adopt strategies that enhance the agricultural sector's resilience and adaptability and mitigate climate change's impacts:

(a) Research and Development: Investing in research and development can provide innovative solutions to help the sugar cane and cattle industries adapt to climate change. For instance, breeding temperature and drought-resistant sugarcane varieties can help farmers maintain productivity in changing climate conditions. Likewise, research into heat-tolerant cattle breeds, efficient grazing systems, and alternative feed resources can improve the resilience of the cattle industry.

Moreover, the development and promotion of precision agriculture technologies, such as remote sensing and data analytics, can aid in efficient resource management, early disease detection, and the optimisation of planting and harvesting schedules, ultimately improving the overall sustainability and resilience of these sectors.

(b) Capacity Building and Education: Farmers should be educated about the implications of climate change for their industries and the potential strategies for adaptation and mitigation. Workshops, training sessions, and extension services can be used to disseminate knowledge on sustainable farming practices, water and soil management, the use of weather forecasting tools, and the benefits of biodiversity.

For sugar cane farmers, this could involve learning about crop rotation, intercropping, and organic farming to enhance soil health and productivity. For cattle grazers, this might include education on rotational grazing, the importance of shade and water availability for livestock, and strategies for managing heat stress.

(c) Policy and Regulatory Support: The government can play a crucial role in supporting the transition towards climate-resilient agricultural practices through favourable policies and regulations. For cattle grazing, policy support could include incentives for the adoption of methane-reducing feeding strategies or the implementation of carbon farming practices.

Moreover, legislation could be strengthened to ensure the restoration and preservation of natural ecosystems that support biodiversity, sequester carbon and serve as a natural buffer against climate extremes.

(d) Infrastructure Investment: Improvements to agricultural infrastructure can help farmers better manage the impacts of climate change. In the context of sugar cane production, this could involve investment in efficient renewably powered irrigation systems to better manage water resources under changing rainfall patterns and reduce emissions. For cattle grazing, infrastructure investment might include improved shade structures to mitigate heat stress in livestock.

(e) Transition to Renewable Energy: The transition away from fossil fuels and towards renewable energy sources, such as solar or wind, can significantly reduce the agricultural sector's carbon footprint.

For sugar cane production, renewable energy can be used to power machinery and processing plants, reducing reliance on coal-based energy. The sugar cane industry also has the unique opportunity to produce bioenergy from byproducts like bagasse and trash, turning waste into a valuable energy resource.

In cattle grazing, renewable energy sources can be used for powering farm operations, such as water pumps and fence chargers. Furthermore, the integration of renewable energy technologies can open up diversified income streams for farmers, such as leasing land for wind farms or solar panels.

By addressing these opportunities, the Queensland Government can help the sugar cane and cattle industries in Central Queensland not only adapt to the impacts of climate change but also become more sustainable and resilient in the face of future challenges.

CONCLUSION

The agricultural sector is a vital component of Queensland's economy and social fabric but it is under increasing threat from climate change. The Queensland Government has an essential role in ensuring that the sector is prepared and resilient in the face of this challenge. MCG looks forward to a collaborative and constructive engagement to safeguard our shared future.

Yours sincerely

Peter McCallum

Coordinator

Mackay Conservation Group

peter@conservation.org.au

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