Climate, Energy and the Agricultural Sector

The Impact of Climate Change on the Water-Energy-Food Nexus in a already complex Agri-food System.

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Climate change and agriculture

Climate change is affecting every country on every continent. It is disrupting national economies and affecting lives. Weather patterns are changing, sea levels are rising, and weather events are becoming more extreme. The science of climate change is becoming increasingly undisputable: globally climates are changing and human activities are contributing to the rate of change. There is debate around the extent of change and the effects or impact of the change but gradually governments, the private sector, donor organizations and the public are making firm commitments to accelerate mitigation and adaptation actions to address climate change. There is mounting pressure and collective acknowledgement that delaying action to address climate change will increase the environmental and societal consequences and the costs required to address or rectify the impacts.

The increase in average temperature that characterises climate change, when taken together with changing rainfall patterns, is likely to shift optimum growing areas for key crops, and generate an increase in the frequency and severity of extreme and moderate weather events. These challenges are super-imposed upon the many other stressors that the food system already faces due to environmental degradation, disease outbreaks, and higher input costs, which are themselves compounded by issues of land rights and inequality. Furthermore, in recent years the world has witnessed increasing ad hoc/protectionist trade policy responses by various countries to external shocks like droughts, war and COVID lockdown regulations. Additionally, concerns around future projected water supply constraints, the decline in water quality and increased competition from non-agricultural sectors is likely to have a significant impact on food production volatility and food security concerns. This converts into increased vulnerability in agriculture over the medium to long-term and poses new risks to farming and food production unless measures are taken now to strengthen the resilience of production systems and to learn, adapt and cope with climate change.

The UN Climate Change Conference in Glasgow (UNFCCC COP 26, 2021) brought together 120 world leaders and over 40,000 registered participants (delegates, observers and media representatives) to negotiate global commitments and new climate plans. **Error! Hyperlink reference not valid.**The four overarching commitments from COP26 are:

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- **Secure global net zero by mid-century and keep 1.5 C degrees within reach by:**
  - accelerating the phase-out of coal
  - curtailing deforestation
  - speeding up the switch to electric vehicles
  - encouraging investment in renewables.
- **Adapt to protect communities and natural habitats.**
- **Mobilise at least $100bn in climate finance per year.**
- **Work together to deliver;** finalising the Paris Rulebook and accelerate action to tackle the climate crisis through collaboration between governments, businesses and civil society.

What is Net Zero and why is it important

Net Zero is the requirement to cut greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere by oceans and forests. Net Zero is largely accepted as the scenario that will avert the worst impacts of climate change and preserve a liveable planet. To achieve Net Zero, the global temperature increase needs to be limited to 1.5°C above pre-industrial levels. Currently, the Earth is already about 1.1°C warmer than it was in the late 1800s, and emissions continue to

rise. To keep global warming to no more than 1.5°C – as called for in the Paris Agreement – emissions need to be reduced by 45% by 2030 and reach net zero by 2050 (UNFCCC COP 26, 2021).

The agricultural sector has a multifaceted role when it comes to climate change. It is recognised as a significant net contributor to greenhouse gas emissions, both carbon dioxide (CO2) and Methane (CH4). According to the United National Statistics (UNSD) emissions from primary agricultural make up around 22% of the world's greenhouse gas emissions with the entire agricultural food chain (including fertiliser, transport, processing, and sale) contributing as much as 29% of global emissions *(IPCC, 2019*). However, agriculture also provides natural removal and sequestration of carbon dioxide and plays a vital role in the livelihoods (job creation, food security, poverty alleviation) of around 40% of the global population. Ensuring sustainable agricultural practices are implemented and that all natural resources are responsibly managed across the interlinked sectors of energy, mining and agriculture is imperative to sustain economic activities that enhances livelihoods and addresses climate change.

South Africa's commitments

South Africa's CO_2 emissions are amongst the highest per capita emissions in the developing world. This is due to South Africa's strong reliance on a coal-based energy production system, and heavy emissions from the transport sector. As part of South Africa's efforts to meet the Climate Change Paris Agreement objectives, South Africa, in partnership with other role players, reiterates its commitment to making a contribution to limiting the world's average temperature rise to below 2°C as compared to pre-industrial levels and pursuing efforts to limit the global average temperature rise to 1.5°C in alignment with the Global Net-Zero commitments made at COP26.

There are some policies, regulations, plans and programmes in place that are intended to deliver emissions reductions. These policies and strategies focus on the preparation and strengthening of institutional frameworks for improved management of climate change effects and to make available the necessary resources to support strategic adaptation activities and to advance low emission and climate resilient development. However, it seems that South Africa's agricultural and forestry sector has made a limited contribution thus far. The Draft Climate Smart Agriculture Strategic Framework for Agriculture, Forestry and Fisheries (2018), outlines the role that Climate Smart Agriculture (CSA) can play in addressing vulnerabilities facing the agriculture sector, but needs to be taken further.

South Africa is exceptionally vulnerable to climate variability and changing weather patterns since it is highly dependent on rain-fed agriculture and limited in high potential cropping land. It is known to have high levels of poverty, particularly in rural areas, with a low adaptive capacity. South Africa already experiences a high degree of risk from natural hazards and disasters, such as droughts, floods, and storm-related events, including high winds, coastal storm surges, and hail, all of which are likely to be exacerbated by climate change (DEA, 2013 and Schulze, 2019).

When it comes to climate change and the understanding of for instance temperature and precipitation changes and their potential impact on the agricultural sector in South Africa, BFAP has applied its models and analytical approach in the past to quantify and illustrate some of the impacts of climate change by:

- Quantifying the competition for natural resources (i.e. land and water) among the agricultural, mining and domestic users in the various catchments areas of South Africa (BFAP, 2015 and BFAP, 2012)
- Evaluating the impact of climate change on the South African agricultural sector through crop modelling linkages and partial equilibrium model applications (DEA, 2013)
- Identifying land use change and risks to natural resources that pose constraints to agricultural activity expansion. (BFAP, 2021)
- Livestock sectoral growth vs the natural resource constraints (BFAP, 2021).

The effects of climate change on agriculture should be seen in terms of both productivity of farming operations and the risk of disruption of production, with implications for food security and incomes for South African households. There is evidence that smallholder and subsistence dryland farmers are more vulnerable to climate change than commercial farmers, while large-scale irrigated production is probably least vulnerable (but make a greater contribution to emissions and, in contrast, also have the ability to invest in mitigation and renewable alternatives), conditional upon sufficient water supply for irrigation.

To truly address climate change and prioritise the interventions and investments that are required to achieve net zero by mid-century there needs to be a cross-sector integrated approach with respect to the water, energy and food nexus. With the demand for all three resources continuing to grow and supply limited, the trade-offs within these resource sectors, between them, and with the rest of the economy need to be considered carefully. Achieving Net Zero targets requires a shift towards strategic investments and interventions that focus on an integrated value chain approach that reduces and removes GHG emissions. Innovation and investment into technology and techniques to accelerate climate change mitigation and adaptation of the agri-food systems is pivotal in successfully managing the complexity within the Land – Energy – Food Nexus and achieving the overarching commitments from COP26.

Greater understanding and cohesion between policy-makers, industry stakeholders, and society at large around the fact that agriculture's role in climate mitigation is much broader than climate science alone can inform is required. Such cohesion would dramatically improve the rate at which innovation, investment and impact could be achieved within the sector.

References

- Glasgow Climate Change Conference (UNFCCC COP 26)' (Earth Negotiations Bulletin, November 2021) available at https://sdg.iisd.org/events/2020-un-climate-change-conference-unfccc-cop-26/ . UNFCCC, Nationally Determined Contributions under the Paris Agreement.
- IPCC, 2019: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O. Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey, S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick, M. Belkacemi, J. Malley, (eds.)]. In press.
- DEA (Department of Environmental Affairs), 2013. Long-Term Adaptation Scenarios Flagship Research Programme (LTAS) for South Africa. Climate Change Implications for the Agriculture and Forestry Sectors in South Africa. Pretoria. South Africa.
- BFAP, 2021. Trade-led competitiveness development for strategy and planning purposes: Towards a targeted growth strategy for the sector. Department of Agriculture, Forestry and Fisheries (DAFF). Pretoria. South Africa.
- BFAP, 2012. Evaluating the impact of coal mining on agriculture in the Delmas, Ogies and Leandra districts – With a specific focus on maize production. Funded by the Maize Trust. Pretoria. South Africa.
- BFAP, 2015. The Balance of Natural Resources: Understanding the long term impact of mining on food security in South Africa. Funded by the Maize Trust. Pretoria. South Africa.

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