

CLIMATE CHANGE FACTSHEET: AGRICULTURE AND CLIMATE CHANGE: A LOSING BATTLE?

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As global greenhouse gas emissions rise, the climate changes more and more rapidly — posing a major threat to the agriculture industry, and more so the food and nutritional security of the world. The rise in global temperatures leads to increased crop respiration rates, higher pest infestation and reduced crop duration. Furthermore, climate change affects microbial activities in the soil.



The majority of Namibians depend directly or indirectly on agriculture for their livelihoods, making it one of Namibia's most important sectors. A sector which is now extremely vulnerable to the effects of climate change, especially decreased rangeland productivity and threats of more frequent and severe droughts.

Shocking facts on climate change and agriculture^{1, 2}



The average global temperature is increasing continuously and is predicted to rise by 2°C by 2100. The global average temperature has increased in the range of **1.2°C** since 1850. By 2400 the average global temperature is expected to rise by **4.2°C**

60–80%

of the global temperature rise, sea-ice reduction, and upper-ocean warming since 2005 has been contributed by developed countries. **Developing countries have had around a 20–40% contribution to the global temperature rise, sea-ice reduction, and upper-ocean warming since 2005.**

There must be an annual increase of 60% in the world's agricultural production from 2005 to 2050 to fulfil the food and nutritional requirements of the population.

Global warming will pose a severe threat to the world's food security, but if it is limited to **1.5°C**, developing countries' vulnerability will be reduced by **76%.**

The current industrial food system is responsible for **44 to 57% of all global greenhouse gas emissions.**



The yield of major crops in the drier areas of Africa is expected to be reduced by more than **50%** by 2050 and by almost **90%** by 2100. In sub-Saharan Africa, the average crop yield is projected to be reduced by **6–24%** due to climate change. **Climate change is projected to reduce the global cereal production of maize and wheat by 3.8% and 5.5%**

In 2019, the annual agricultural output in Namibia and Botswana was estimated to have fallen to below 50%

Droughts are predicted to become more frequent due to climate change. By 2100 the drought-affected area is projected to increase from **15 to 44%**

For each **1%** change in rainfall, there is an effect of **1.2 to 1.6%** on carrying capacity. A decline in carrying capacity of **10%** in southern and **15%** in central Namibia is expected due to climate change. In 2019 the rainfall was the lowest recorded in Windhoek since 1891 and the drought was the worst in the last **90 years** in Namibia. **A further decline in rainfall over the southern African region is expected of up to 5%**

¹ Impact of Climate Change on Agriculture and Its Mitigation Strategies: A Review (Source: Malhi, G.S.; Kaur, M.; Kaushik, P. Impact of Climate Change on Agriculture and Its Mitigation Strategies: A Review. Sustainability 2021, 13, 1318. <https://doi.org/10.3390/su13031318>.)

² Shikangalah. R. 2019. The 2019 drought in Namibia: an Overview.

THE IMPACT OF CLIMATE CHANGE ON AGRICULTURE³

Considering agriculture's sensitivity to weather parameters, it makes sense that it is the most vulnerable sector in the face of climate change. A rapidly changing climate puts plants under severe stresses like drought, heat and cold stress, this further causes water shortage, degrading soil fertility, lower yields, pest infestations and diseases in crops. The rise in temperature will also reduce crop duration - the production of wheat, rice and maize is expected to decrease significantly should Southern Africa experience a warming of 2°C.

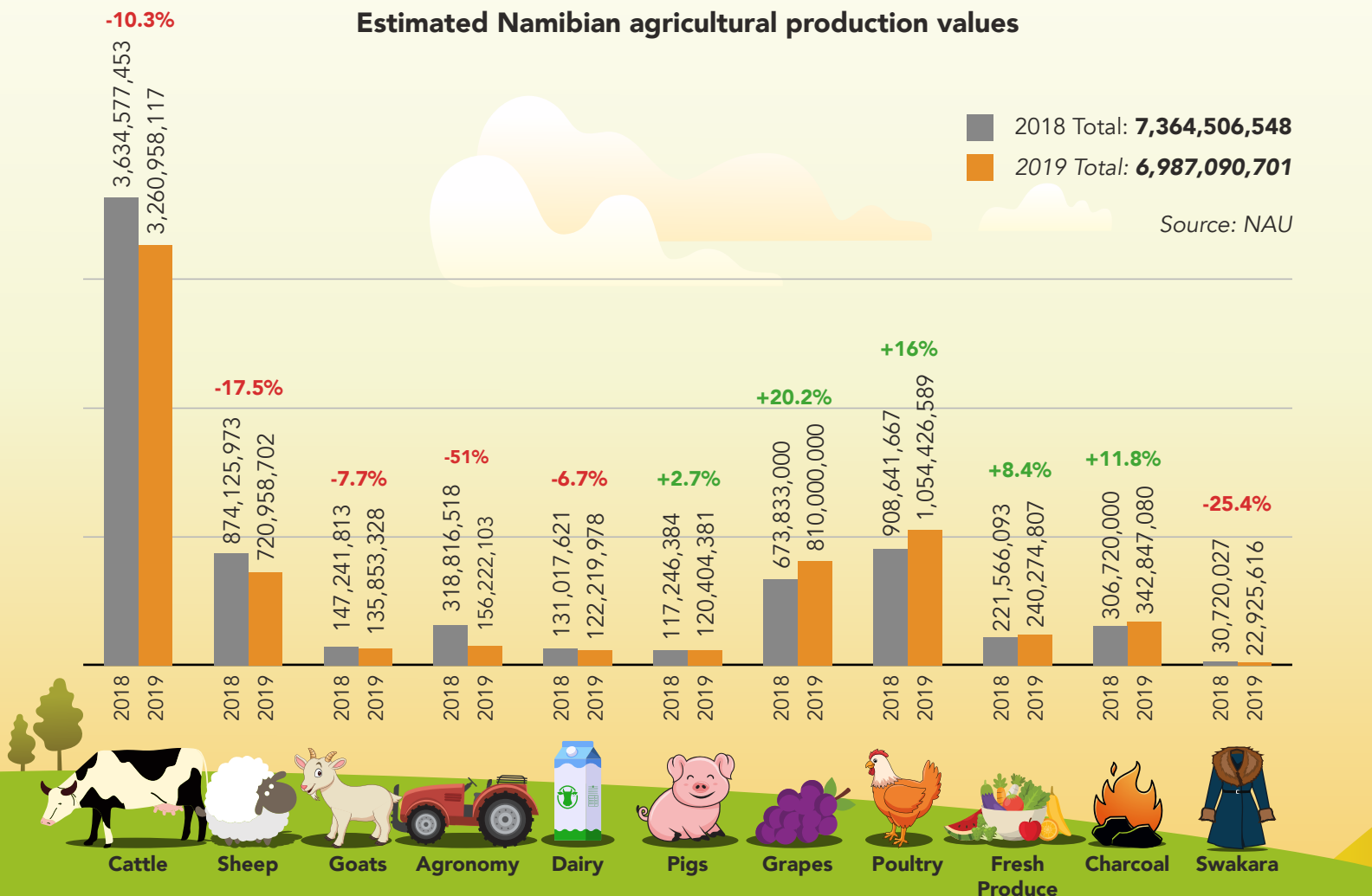
Unfortunately it is not only crops that will feel the impact of climate change, the livestock industry will also be influenced as variability in rainfall and rising air temperatures directly affect the adaptability of livestock.

THE THREAT OF DROUGHT

Namibia is one of the most vulnerable countries to rapidly increasing droughts due to its extreme aridity in some parts. Although the country has already been through many years of drought, it is predicted to become more frequent and severe as global temperatures rise. In 2019, poor rainfall and low soil moisture caused by an ongoing drought left the population food insecure and with diminished livestock numbers⁴.

According to the Namibia Agricultural Union's (NAU) 2020 Annual Report, a seven-year-long drought, from 2013 to 2019, had a noticeable negative impact on producer prices, the condition of rangelands and water availability. This resulted in financial losses and a surge in cow marketing which influenced the production capacity of the livestock industry. By June of 2019 the agricultural debt was calculated at N\$7,1 billion — a 13% increase in overall debt.

The graphic below contains production value estimates of various agricultural enterprises defined as the annual output from primary produce marketed in the formal market at actual nominal producer prices:



As seen above, agriculture production in 2019 decreased by 10.3% compared to 2018. Due to low production caused by the ongoing drought, the agronomy sector's production value dropped by more than 50% year-on-year. The production value of sheep also decreased by 17.5% while the cattle sector's decreased by more than 10%.

³ Impact of Climate Change on Agriculture and Its Mitigation Strategies: A Review (Source: Malhi, G.S.; Kaur, M.; Kaushik, P. Impact of Climate Change on Agriculture and Its Mitigation Strategies: A Review. Sustainability 2021, 13, 1318. <https://doi.org/10.3390/su13031318>.)

⁴ Shikangalah. R. 2019. The 2019 drought in Namibia: an Overview.

HOW DO CATTLE CONTRIBUTE TO GLOBAL WARMING⁵?

Although agriculture is one of the most affected sectors by climate change, it is also one of the biggest contributors to global warming. In particular, methane produced by cattle during a process referred to as enteric fermentation. This digestive process of cattle releases methane, a potent greenhouse gas when they expel gas (yes, cow farts and burps contribute to global warming). Enteric fermentation occurs when anaerobic microbes, called methanogens, decompose and ferment the food in the animal's digestive tract which is then absorbed by the cow or bull.

Furthermore, carbon dioxide emissions from grain-fed beef are extremely high because of the fossil fuel required for the production, distribution and application of synthetic fertilisers for grain production.

However, studies show that rangelands managed according to the principles of regenerative agriculture, including appropriately managed and rotationally grazed perennial grasslands, can result in more atmospheric carbon being returned to the soil than is being emitted by livestock.

This is especially beneficial because carbon in the soil improves the soil structure, which leads to an increased water-holding capacity which in turn reduces runoff and flooding while also increasing plant productivity.

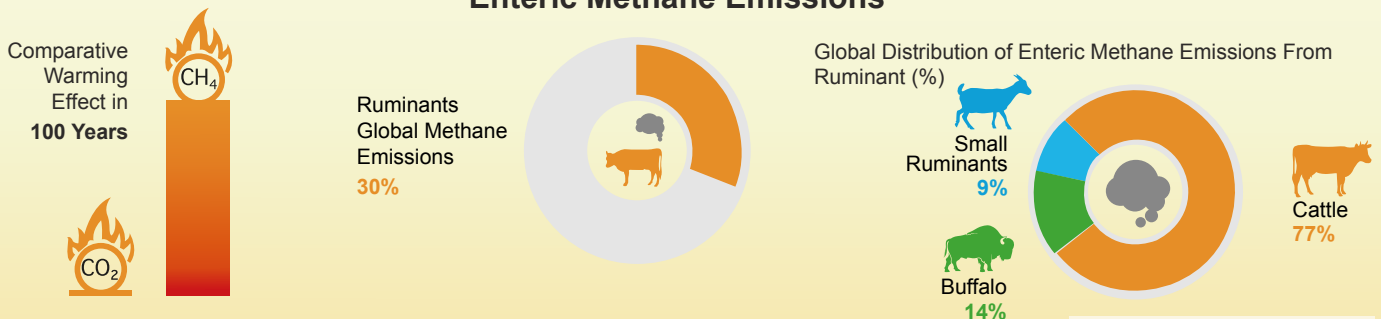
THE WAY FORWARD

Implementing the best and sound rangeland management principles that are environmentally friendly will aid in mitigating the impact of climate change, increasing employment, reducing man made droughts in Namibia and improving ground water supply for farms and towns. Namibia has more than 60 million hectares of rangeland that can be restored and bring carbon back into the soil with increased levels of dead plant material in the soil.

Regenerative agriculture is one solution that agriculture industries all over the world can take on to mitigate instead of contributing to the climate crises.

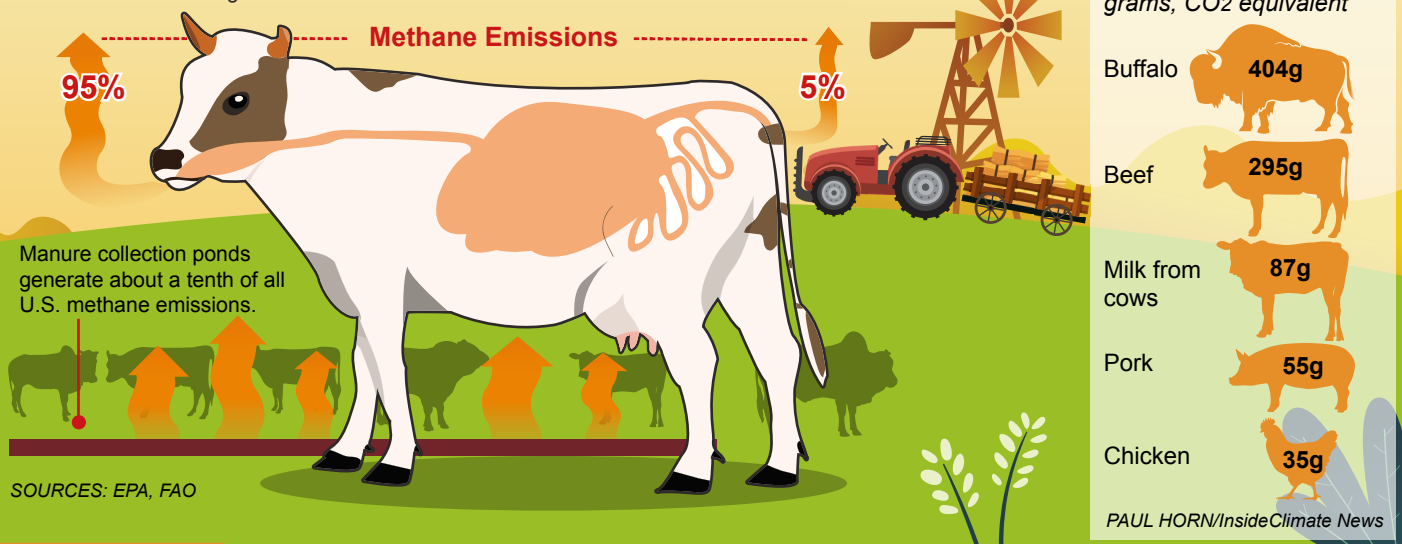
The loss of fertile soil and biodiversity can be detrimental to the survival of this planet. If we actively protect and regenerate the world's soil it will be more than possible to feed the population, keep global warming below 2 degrees celsius and halt the loss of biodiversity.

Enteric Methane Emissions



Livestock-Based Methane Emissions

About a quarter of U.S. methane emissions come straight out of livestock, most of it from belching.



⁵ Namibia agricultural union. 2019. Reviving Namibia's livestock industry (regenerative livestock production).

WHY REGENERATIVE AGRICULTURE?

Regenerative agriculture is a holistic land management practice that utilises photosynthesis to close the carbon cycle, build soil health, crop resilience and nutrient density. By using practices that increase soil organic matter, regenerative agriculture improves soil health and increases soil biota diversity and biodiversity below and above the surface area. This furthermore improves the water holding capacity of the soil and aids in sequestering carbon, thus absorbing harmful levels of atmospheric carbon dioxide⁶. The goal of regenerative agriculture is to use technologies that regenerate and bring life to the environment. Healthy soil spills over to healthy food, people and economy. These technologies incorporate permaculture and organic farming practices, some of which are described in the table below⁷.

Regenerative Agricultural Practices:

Aquaculture is the breeding, rearing, and harvesting of fish, shellfish, algae and other organisms in all types of water environments. It is used to produce food and other commercial products, restore habitat and replenish wild stocks, and rebuild populations of threatened and endangered species.

Agroecology is a holistic and integrated approach that applies ecological principles to the design and management of sustainable agriculture and food systems. It seeks to optimise the interactions between plants, animals, humans and the environment while also mitigating climate change.

Agroforestry is an intensive land management system that optimises the benefits from the biological interactions created when trees or shrubs are deliberately combined with crops and livestock. There are five basic types of agroforestry practices, they include windbreaks, alley cropping, silvopasture, riparian buffers and forest farming.

Biochar is a charcoal-like substance that's made by burning organic material from agricultural and forestry wastes (also called biomass) in a controlled process. Although it looks a lot like common charcoal, biochar is produced using a specific process to reduce contamination and safely store carbon. Biochar technology can mitigate climate change, improve soil quality, reduce waste and produce energy as a byproduct.

Composting is the natural process of recycling organic matter, such as leaves and food scraps, into a fertiliser that can enrich soil and plants. It provides an ideal environment for bacteria, fungi, and other organisms, like worms, to do their work.

Holistic planned grazing is when animals are moved from one grazing camp to another - mirroring the natural herding behaviour of animals. Grazing involves longer rotations of ideally 30 days or more, which gives grass time to fully recover before being regrazed. The grass is grazed for short periods and longer grass is trampled, incorporating organic matter into the ground. The manure is also spread more evenly. This practice could help farmers increase their grass productivity by up to 300% without expensive inputs and reverse climate change.

No-till farming is the practice of cultivating crops on the land with minimal disturbance to the soil.

Pasture cropping is a farmer-initiated land management system that integrates cropping with pasture production, and allows grain growing to function as part of a truly perennial agriculture. Annual winter growing cereal crops are directly drilled into living summer growing perennial pasture grasses. This allows year-round growth and eliminates bare ground.

Silvopasture is the deliberate integration of trees and grazing livestock on the same land. These systems are intensively managed for both forest products and forage, providing both short and long-term income sources.



KNOW YOUR ENVIRONMENTAL POLICIES:

The National Rangeland Management Policy (NRMP)⁸ was approved in 2012. In 2014, The National Rangeland Management Policy and Strategy (NRMPS) project was commissioned in support of this policy, under the Ministry of Agriculture, Water and Forestry (MAWF), to address the declining natural resource base in Namibia.

The NRMPS-project was designed to initiate the implementation of the NRMP in order to secure the economic basis for a growing population that depends on the sustainable management of our rangelands.

The goal of the NRMP is to enable farmers and managers to manage their rangeland resources in such a way that:

- Animal production per hectare is sustainably improved.
- Vulnerability of users to a highly variable resource base is decreased.
- Awareness of the current situation is created.
- Biodiversity is improved and maintained.

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⁶ Regenerative Agriculture Initiative, What is regenerative agriculture? 2017. California State University (thecarbonunderground.org)

⁷ Why regenerative agriculture? <https://regenerationinternational.org/why-regenerative-agriculture/>

⁸ National Rangeland Management Policy. 2011. Namibia Agricultural Union.