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A Battle with Milkweed Locust Swarms

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The seasonal predictions probabilities indicate the sea surface temperature anomalies to indicate that El Niño conditions are most likely to reach maximum from November 2023 to May 2024. The weak El Niño phase in 2023/24 transitioned to a strong event in February 2024 which may subside from the April-May-June 2024 season. From February to May 2024 the El Niño probability is at its highest strength, with a distinct increase in La Nina probabilities from May to October 2024 (Figure 1). From October 2023 to March 2024, which is the summer season, the central part of South Africa experienced a myriad of extreme weather events accompanied by disease and pest outbreaks. The 2023/24 planting season climate conditions resulted in poor agricultural production, the most hit agricultural enterprises were the grain, fruits, and vegetables enterprises.

Crop and pasture productivity was sustained by the accumulated soil water content from the previous above-normal rainfall seasons, which supported crop and pasture growth and development at the commencement of the season. However, the prolonged dry spells worsened which contributed to the

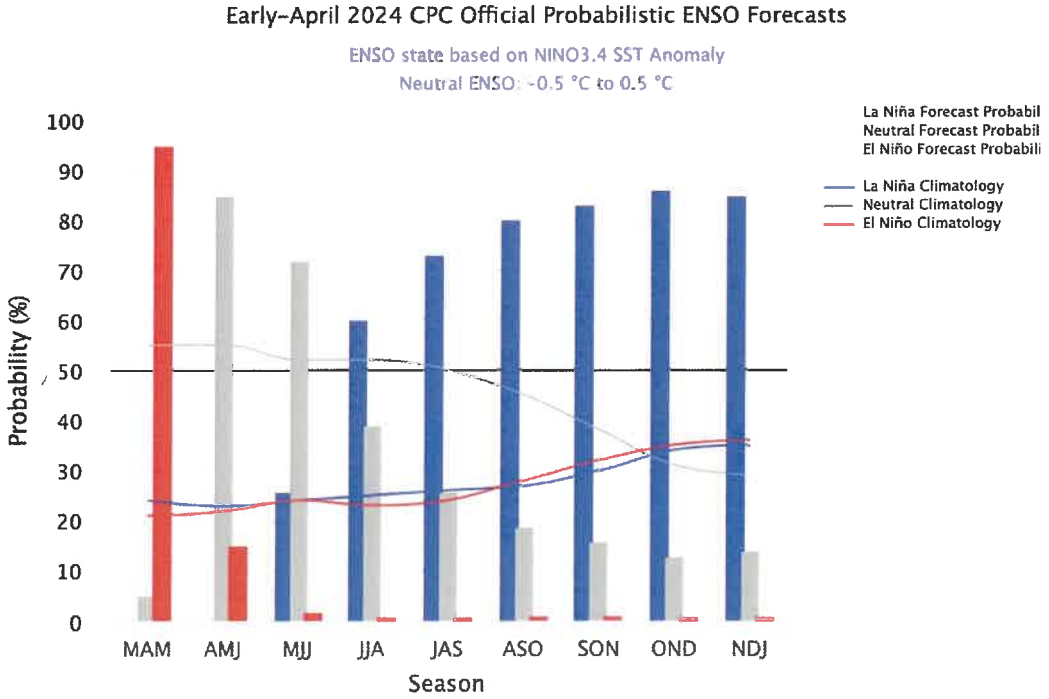


Figure 1. Mid-June Model-based probabilistic ENSO predictions (https://iri.columbia.edu viewed, July 2023)

decrease in crop growth and development. The weather events that occurred during the season 2023/2024, were identified to be heat waves, prolonged dry spells, and poor rainfall amount and distribution. This further resulted in crop failure and affected the socio-economic status of many farmers across South Africa. The prolonged dry spells result in decreased water levels in reservoirs, water restriction for supplementary irrigation, crop failure, poor pasture, poor livestock conditions, inflated food prices, food insecurity, diseases, and pests' manifestations. Grasshoppers was spotted in many towns within the Free State proximity and the surroundings, the towns that were highly affected are Vredefort, Odendaalsrus, Thaba Nchu, Botshabelo, Hennenman, Soutpan, Bultfontein, Wepener, Soutpan, Dewetsdorp, and Bloemfontein. Accordingly, the ecological conditions conducive to grasshoppers and locust development are well-known and include meteorological phenomena in a particular location and time distribution of rainfall. Climate change-driven extreme weather events, such as persistent, heavy rains and heat waves can intensify grasshopper species swarms. Green bush locust are grasshopper species which occurs in the east and southern Africa, and in higher altitudes of Malawi, Zimbabwe, and Tanzania.

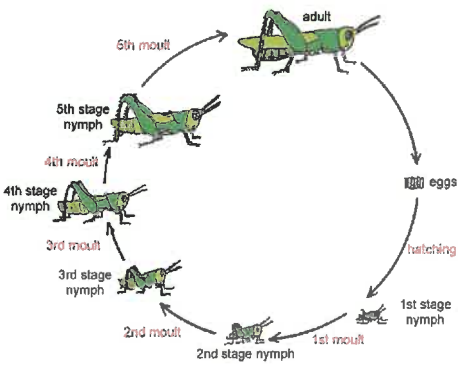
Milkweed Swarm in the Central Part of South Africa

Reports of Milkweed locust swarm appearance came from all parts of the Free State province and the surrounding towns, from the middle of February 2024. A locust swarm spectacle is distressing to the farms and their agroecosystems, with massive areas of cash crops and grazing destroyed by swarms of Milkweed locusts. The climatic conditions that occurred in the central part of South Africa, the receipt of below normal rainfall coupled with heat waves created a conducive environmental condition the mating, egg laying, and locust plague. The destructive path is determined by the prevailing wind patterns of the day and the weather conditions.

As demonstrated in Figure 2(a, b, c), the African locust has three stages in its life cycle, egg, hopper, and adult, with the hopper passing seven instars (Figure 2 (a). The Milkweed locust's life cycle consists of 3 – 6 months and a mature locust may lay over 100 eggs a day. It is a fast-growing pest; the larva requires only a duration of 20 days for maturation. With the maturation of the larva, the next generation of pests initiates. The climate conditions from November to March 2023 ranged from 25 – 32°C temperature with humidity of about 85 – 92% are optimal

(a)

(b)



(c)

Figure 2 *Phymateus viridipes* commonly known as Green Milkweed locust or African bush grasshopper (a) Green Milk locust at hopper stage 26 March 2024, (b) Green Milkweed with 1st and 2nd generation on locust which are at a hopper and adult stages, 26 March 2024 and (c) indicate the Green Milkweed lifecycle.

conditions for its growth. The Milkweed locusts could travel 130 km per day because of their ability of powerful and long flights.

In southern Africa, the most devastating generation phenomenon occurs through summer and autumn, while most crops are at the vegetative to maturity growth stages. Figures 2 (a) and (b) indicate locust infestation at selected farms, taken on 26th March 2024. (a)(b) (c)
The fluctuations of extreme weather events, interchangeable heat waves, heavy rainfall, hailstorms, and a prolonged dry spell in January 2024, marked the end of a prolonged dry spell and stimulated locust activity from February to March 2024. Locust infestations are the most destructive bio-pests of cash crops and pasture. According to the agricultural perspective, any animal or plant that is harmful to human concerns like crop production and livestock is known as a pest. This locust phenomenon, exacerbated crop failure in the area since producers were already struggling with drought effects. It is this highly localized effect that allows the authors to identify the impacts of such an infestation.

The implications of green bush locusts' outbreaks on crop production.
Locust swarms' appearance on crop fields, pasture, and vegetation is most devastating to farmers. Locusts have an impact on the environment, pasture, and production of pasture for feed and food. Locust swarms destroy crops through leaf destruction in which leaves are damaged. For example, swarms devour the male inflorescence and cobs in maize, wheat stems are bitten through, and grains are eaten; it causes unrepairable effects on leafy vegetables, such as Swiss chard, pumpkins, and legumes. Therefore, this causes major agricultural damage, which may lead to food insecurity, and loss of biodiversity, resulting in famine and starvation. The pest caused 60-100% production damage in crops rendering significant distortion in total crop produce available for consumption and income generation. With the intensification

Figure 3 Green Milkweed locust indicating a hopper and adult stage, picuture taken from Thaba Nchu and Soutpan in March 2024.

of extreme weather events, South Africa's agriculture is highly vulnerable to the effects of the locust outbreaks. The attack affected by locusts endanger food security with a possibility for food shortages, inflated food prices and humanitarian crisis in communities. The affected central part of South Africa has insufficient early warning systems and unstructured knowledge dissemination channels.

Green bush locusts outbreak intervention measures

Preparedness and prompt action play an essential role in strengthening the coping capacities of vulnerable agricultural communities and improving the resilience of livelihoods to threats and shocks. Early Warning-Early Action System plays a crucial role mostly in semi-arid areas of southern Africa to adopt agricultural adaptation strategies. Action taken before locust manifestation disaster occurrence can significantly lessen the impact on vulnerable farmers. South African prediction centres and agricultural institutions are alerting the communities and monitoring extreme weather events, encouraging development, but most of the time the information reaches the end users later, and thus delays the execution of preventative measures.

The localized recommendation for the Central part of South Africa

- To permanently monitor the atmospheric conditions using the National Agrometeorological Committee Advisory and other sources of seasonal predictions
- To regulate the influence of rainfall on the development of crop stages and vegetal biomass
- To use the precipitation radar, automatic weather stations and Meteosat Satellites
- To develop localized early warning systems and use E-locust scouting App to battle swarms.
- To take cognizance of locust infestation from nearby countries and continents and migratory patterns
- To strengthen capacity building to provincial agricultural Advisors on Climate-Smart Agriculture and the Early Warning Systems

The use of insecticides and pesticides to prevent and contain the spread of the swarms was viewed the most optimal control strategy. Although there are concerns about its harmful properties to human health, hence recommendations are to opt for green technologies and biological means and should focus on sustainable agricultural production, agroforestry, and agroecology. The Agricultural Research Council plays a major to keep its agricultural community informed about the occurrence of weather extremes and its impact on agricultural productivity and production. The authors advocate for the strengthening of collaborations and partnership by the Department of Agriculture and Rural Development in the Free State and nearby provinces with the Agricultural Research Council and other relevant institutions towards, the development of localized early warning systems, provisions of trainings pertaining to the rules and regulations concerning the use of pesticides that target the physiology of the locust while minimizing the harmful effects on the environment of humans and to intensify research on with regard to finding the suitable controlling measure and the breeding patterns of locusts.

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