



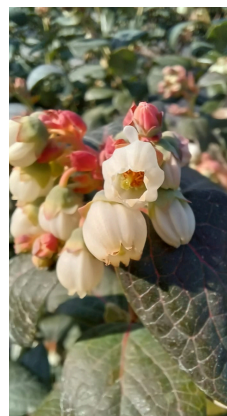
Pollinator Diversity as a Bridge Between Conservation and Agriculture: Insights from South African Blueberry Crops

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The Man and the Biosphere programme

The Man and the Biosphere (MAB) programme is an intergovernmental scientific programme by UNESCO that aims to establish a scientific basis for enhancing the relationship between people and their environments. It combines the natural and social sciences with a view to improving human livelihoods and safeguarding natural and managed ecosystems. This, therefore, promotes innovative approaches to economic development that are socially and culturally appropriate and environmentally sustainable.

The global network includes 759 reserves, 90 of which are in Africa. South Africa is the continental leader of the network, with ten of these reserves. This makes research on South African MABs of local and continental importance.



The Cape Winelands Man and the Biosphere Reserve with a blueberry farm in the front and the nature reserve in the back, is one of the largest production sites of blueberries (middle, right) in South Africa. Left: © RMCA ; middle and right: © Francois Bekker.

The Western Cape, home to the globally unique Cape Floral Kingdom, is a biodiversity hotspot that conserves over 2.3 million hectares across national parks, nature reserves, mountain catchments, and marine protected areas. These mountainous conservation regions are interspersed with agricultural production systems with unique climates.

One such system is the production of blueberries in the Western Cape of South Africa, where 60% of the country's blueberries are grown. As a high-value crop, blueberries offer promising economic opportunities both locally and for export.

Blueberries are considered a superfood and have a low ecological footprint, which makes them ideal for integrating with natural areas. In the Western Cape, blueberry farms are often found near established MAB reserves such as the Cape Winelands and the Kogelberg.

The problem

While many varieties are self-fertile, blueberry plants bear even better quality and size fruits when they are cross-pollinated with another variety. Blueberry pollination remains under-researched and presents a major challenge. South Africa lacks native bumblebees that are typically effective buzz pollinators of blueberries, relying instead on honeybees. However, honey bees are considered largely inefficient and are vulnerable to global climate change, parasites and diseases. The region lacks other native social bees that are typically effective buzz pollinators.



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Additionally, in regions like the Western Cape, sporadic hailstorms, strong winds, or intense sun can damage the delicate berries and plants. Netting provides a protective barrier against adverse weather events and may also modify the orchard's microclimate, which can improve plant performance and reduce water loss through evapotranspiration.

Netting, however, also reduces honey bee foraging activity and colony strength, and lowers pollen flow in blueberry orchards. The effects of netting on other putative pollinators, such as wild bees and flies, are unknown. Evidence-based decision support systems to optimize pollination and yields in blueberry production systems are, therefore, urgently required.



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The solution

By promoting a greater diversity and abundance of alternative pollinators, while retaining the positive benefits of netting, blueberry production can be enhanced. The blueberry plant belongs to the Ericaceae family, and the crop may benefit from transferable pollination services. Particularly, flies (Diptera) and wild bees (Hymenoptera) are well known pollinators of native *Erica* species that form an essential component of the Cape flora.

Research on the interactions between MABs and blueberry farms will not only contribute to the assessment of the biodiversity and ecosystem services of MABs, but also provide valuable insights into the potential pollinator communities associated with blueberry cultivation, and potentially other agricultural crops in this region.

Strengthening collaborative research and outreach with stakeholders, including farmers and local communities, will further support the conservation and enhancement of pollinator habitats within MABs in the Western Cape Province of South Africa.

The following key research areas and topics are recommended

1. Insect and Pollinator Biodiversity in Natural Areas and Blueberry Production Sites

- To compare the diversity of Diptera and Hymenoptera between the MABs and the surrounding agricultural landscape.
- To conduct geospatial analyses of Diptera and Hymenoptera diversity across land-use types.
- To identify Diptera and Hymenoptera flower visitors on blueberries.
- To monitor the seasonal dynamics of pollinators in core areas and blueberry production sites within MABs.
- To characterize plant-pollinator interaction networks in natural areas and agricultural fields and to investigate to what degree MABs serve as sources of pollinators for the agricultural landscape.



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2. Diptera and Hymenoptera Pollinators of Blueberries

- To identify the key Diptera and Hymenoptera species pollinating blueberries.
- To compare the pollination efficiency of Diptera and Hymenoptera (including honey bees) through single- and double-flower visits and pollen load analyses.
- To evaluate the impact of pollination on blueberry yield and fruit quality, including size and taste.

3. Effects of Netting and Cultivar on Insect and Pollinator Diversity and Abundance in Blueberry Fields

- To assess the diversity of Diptera and Hymenoptera in blueberry fields with and without overhead netting.
- To determine diel flower visitation patterns of pollinator species under netted and open-field conditions.
- To compare pollinator diversity and efficiency, and seasonal dynamics, among different blueberry cultivars.



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4. Integrated Pest and Pollinator Management (IPPM)

- To establish mass-reared populations of common South African hover flies (Syrphidae: Syrphinae) and evaluate the potential of syrphine larvae as biological pest control agents on blueberry pests.
- To develop mass-reared populations of common South African blow flies (Calliphoridae) and assess their potential to enhance blueberry pollination.
- To determine the negative impacts of commonly used pesticides on Diptera and Hymenoptera pollinators of blueberries.
- To provide science-based recommendations to farmers for enhancing pollinator services and improving pest management strategies in blueberry cultivation.

To learn more about the Man and the Biosphere Reserves in South Africa, visit <https://researchbiosphere.org/south-african-biosphere-reserves/>



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About the project

The AGRIMAB project is a collaboration between the University of Western Cape (UWC, South Africa), Stellenbosch University (SU, South Africa), the University of Venda (UV, South Africa), the KwaZulu-Natal Museum (KZNM, South Africa) and the AfricaMuseum (RMCA, Belgium). The project is funded by the National Research Foundation (NRF) of South Africa and the Belgian Science Policy (Belspo), and is supported by the Belgian Development Cooperation.



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