icipe develops new remote sensing-based methodology, produces world's first ever flower maps

The International Centre of Insect Physiology and Ecology *(icipe)*, and collaborators have developed a new remote sensing-based methodology to map flowering plants in Africa. Using this methodology, which uniquely combines two hyperspectral mapping formulas, the researchers have produced the world's first ever floral map.

In a paper published recently in the *Remote Sensing of Environment* journal, the researchers present the suitability and accuracy of their new methodology, using a test study site of the spatial distribution, abundance and temporal cycle of flowering melliferous plants (those that produce nectar and pollen, which is collected by honey bees and converted into honey) in Mwingi County, eastern Kenya.

"Hyperspectral technology is one of the most advanced remote sensing strategies, as it combines powerful digital imaging and spectroscopy, thereby increasing the ability to detect discrete materials of interest, and to gather key information towards identifying and classifying them," notes Tobias Landmann, head of *icipe*'s Geo-Information Unit.

"In our test study, we deployed a hyperspectral sensor on an aircraft, which enabled us to collect data on all flowering species over an area measuring 100 square kilometres in Mwingi County. We were able to attain an overall 83 per cent mapping accuracy. As a result, we produced a map showing the distribution, abundance, season and duration of bloom of melliferous plants, otherwise known as a floral cycle. These findings show that it is possible to use remote sensing to map flowers precisely," he explains.

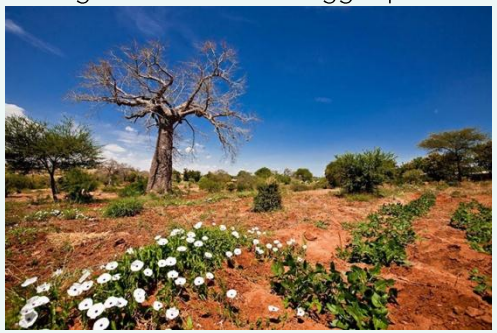
As Dr Landmann further observes, most studies conducted globally on flowering species previously have used ground-based methods. However, such approaches are not cost effective or comprehensive, and they are also prone to too many errors. Remote sensing has several advantages – it saves time, it is relatively economical, and it allows collection of data in areas that would be inaccessible on the ground.

He further notes that remote sensing can either be conducted via space or airborne platforms. Space platforms, however, do not always provide the appropriate data resolution. Airborne platforms are more ideal because they operate from a much lower level than space platforms, thereby providing higher resolution data.

"Based on its successful testing, we now intend to upscale and adapt the methodology we have developed so that it can also be used on satelite data. We expect that its wider application will contribute towards filling critical gaps that exist, especially in Africa, on floral diversity," discloses Dr Landmann.

Knowledge of floral diversity is critical, as it provides understanding of how environmental factors in a given area affect the productivity of bees, or their vulnerability to pests and diseases. As an example, a decrease in the availability of melliferous plants within a landscape, for instance due to deforestation, would indicate that beekeeping and crop pollination have been compromised.

Long-term data on flowering patterns in a given landscape would help to understand nutritional, climate and ecological stresses that trigger pest and diseases in bee colonies. This information can also be used in evaluating pollination effects and the quantity and quality of bee keeping products.



In addition, knowledge on floral cycles can be used to draw up flowering calendars, which categorise flowers, their value to bees, abundance, season and duration of bloom. Floral calendars help to understand bee diversity, and they also underpin landscape conservation efforts that focus on the value of flowering plants for beekeeping.

"Our hope is that better understanding of floral diversity will enable decision makers and beekeepers to discern the interaction between bee colonies and the floral environment, leading to optimised beekeeping. Given the fact that flowering patterns are an important indicator of a range of factors, such as climate change, soil moisture, we hope that remote sensing of floral diversity will contribute towards the ultimate goal of enhancing food security in Africa," concludes Dr Landmann.