Smartphones to map invasive plants in Tamil Nadu

by Sharada Balasubramanian on 20 December 2018

- *Invasive plants are a menace in the Moyar-Bhavani landscape in Tamil Nadu, impacting the growth of local species, ground water, availability of fodder and thus the rural communities.*
- *PARDESI (Participatory Assessment of the Regional Distribution of Exotic Species in India) is an app-based citizen science monitoring programme to catalogue invasive species, being tried out in the Moyar-Bhavani area.*
- *The Ashoka Trust for Research in Ecology and the Environment, Keystone Foundation and World Wildlife Fund have been conducting workshops for local schools and other interested groups to document "invasives hotspots" using citizen walks.*

The Moyar-Bhavani landscape in Tamil Nadu is flanked by Karnataka in the north and Kerala in the west. The landscape represents a diverse habitat with dense forests, agricultural lands and human settlements. Here, invasive plants like *Lantana camara*and *Prosopis juliflora* impact the growth of local species, ground water, availability of fodder, and thus the rural communities.

Ashoka Trust for Research in Ecology and the Environment (ATREE), along with Keystone Foundation, an NGO in Kotagiri, and World Wildlife Fund (WWF) embarked on a citizen science approach to map invasive plants with an Android-based application.

Earlier on, ATREE had started off a campaign called 'spotting invasive alien species' (SPAIS) on India Biodiversity Portal (IBP), where anyone could easily record spotting these species. Inspired by South Africa's volunteer-driven invasive mapping tool called South African Plant Invader Atlas (SAPIA), ATREE launched SPAIS to map the occurrences of 20 common and easily identifiable alien invasive species anywhere in India. Almost 473 observations were recorded on this citizen campaign across India.

Ankila Hiremath, Fellow, ATREE, said, "We had two objectives with SPAIS. One, to create a lot of buzz about invasives because that is not something lot of people think about. The other one was to record occurrences."

Inflorescence of Prosopis juliflora. Photo by J. M. Garg/Wikimedia Commons.

She added, “Though a lot of people joined the campaign, we realised that in terms of information, it would be useful to know which species are more widespread than others. Non-occurrence does not mean that the species is not there. The map had a lot of holes. We thought that our next step would be to become systematic.”

Milind Bunyan, research scientist, ATREE, said, “The campaign gave great information on invasives; however, what it did not give us was two things. One, it did not give us information on how bad the invasion is. For instance, was there only one lantana or was the area covered in lantana? Secondly, if we have a map where there is no lantana, does it mean that there was no lantana, no one went there, or even if they went there, were they not able to recognise it?”

Mapping invasives on an Android app

As the earlier efforts could not capture this specific information, a new grid approach was started to map invasive plants. Called PARDESI (Participatory Assessment of the Regional Distribution of Exotic Species in India), the approach aimed to combine a systematic approach and vegetation sampling with citizen science.

The initial effort of mapping invasives (SPAIS) focused on country-wide mapping; whereas, the latest approach, PARDESI, looked at working at a more localised landscape and adopting a refined approach.

Bunyan said, “This has been done in South Africa, one of the global leaders in invasive species mapping. Through SAPIA, they imposed grids in the entire country. And on these grids, they mapped invasives. We thought why not take this and try on a smaller scale in India at Moyar-Bhavani basin.”

The researchers chose species that were most abundant and widespread.

“We made a list of 87 species and then shortlisted it to 27 with the help of experts,” said Bunyan.

A 10 by 10 square kilometre grid was created in the Moyar-Bhavani basin, as this for more appropriate for this landscape. Within each grid, invasive species were recorded using the Open Data Kit (ODK) app, an open source software used for collecting and managing data. This android application, which can be used on smart phones and tablets, makes data collection and recording easier for researchers, forest department officials, and school children.

Parthenium, which has become a common weed. Photo by Yercaud Elango/Wikimedia Commons.

A form was created in this app, where one could record the presence, density, type of invasives and GPS location. Density of invasives was recorded as a percentage cover from 10 percent as lowest to non-existent to 90 percent, where an invasive species covered large areas.

Mapping with local citizens

Keystone Foundation, an organisation that works in the Nilgiri Biosphere Reserve, trained school and college students by introducing the concept of invasives, why they are a threat and their impacts on the ecosystem and indirectly on human health. For identification, a poster was designed specifically, with images of the 27 invasives shortlisted from the area.

Shiny Rehel, Programme Coordinator (Biodiversity and Eco-restoration), Keystone Foundation, said, “One of the key areas was to involve local skills, like schools. For that, it was important for them to understand how to enter the data. We gave students hands-on training, took them to the field, and were ready to answer their queries. We also gave them devices to record information.”

Bunyan said, “Lantana looks very different on the poster and very different on the field. We need to know what it actually looks like on field, and that was the actual idea. With Keystone Foundation, the students did an invasive species walk, and collected vegetation and invasives data.”

Shiny adds, “If they found species other than the listed 27 species, they would write notes- for instance, was it mosaic landscape, was it a shrub, and so on.”

As smart phones are equipped with GPS and camera, the data is verifiable. When volunteers are at a particular point, they record the GPS location, and can also take a picture of the species. “We will know the area, can locate the space, and can check if there is any misidentification,” said Bunyan.

As it is a volunteer effort, it did not require high investment and could be done part-time. However, volunteers could not be asked to venture into deeper forests for sampling, unlike ecologists. Also, they could not collect data only from one road, as this could sometimes lead to data bias.

Students from The School KFI, Chennai on an “invasives walk”. Photo by Keystone Foundation.

“We had to balance this. As people are volunteers, we wanted this to be easy for them,” said Bunyan. “We asked teams to pre-identify roads that maximise coverage of the grid. You don’t want three roads that are in one corner, you want to spread across the landscape. We tried to get the major land uses, for example, if you have towns, and a tea garden, they sampled a little bit of road, a little bit of tea garden. If there was a tea garden and a forest, the survey was distributed in both the areas than focusing on just one part of the landscape. These were some ways of getting around bias.”

Data from citizen walks

There would be two outputs for PARDESI. One, an idea of how invasives occur across the entire landscape and how dominant they are. The data can also show how bad the invasion is in a certain point. Bunyan said, “When you overlay the output for 27 species, you can identify ‘invasive hotspots’. For instance, this is where five invasive species occur, or this is where lantana is abundant.”

The pilots were carried out over approximately 1500 sq km. The targeted information will be useful for land managers, forest managers, PWD officials, etc.

Bunyan believes that the best place to remove invasives are those areas where they are just coming in, as compared to those where invasives are wide-spread. “If we push back the area where invasives are just coming in, we could possibly save the landscape,” said Bunyan.

With high courts such as the Madurai High Court ordering removal of invasives like *Acacia* and *Prosopis*, there is a serious effort to act on this issue. “This invasive map will give them the data, and where they can actually target on removing these first,” added Bunyan.

ATREE trained forest department officials on invasives and using the ODK app, and hoping to conduct more workshops in future.

The PARDESI Team in September 2017. Photo from ATREE.

Bunyan said, “Some state forest departments, like the Tamil Nadu forest department is showing interest. If this works out, we can do this across the entire Western Ghats, and have a similar atlas like South Africa.”

Hiremath added, “We are in the process of looking at the data, and how we need to refine or tweak to take it further.”

Citizen science is slowly gaining popularity in India with such initiatives. Earlier, scientists had doubt of authenticity regarding data collected by citizen scientists. Hiremath said, “Studies are showing that with a little bit of training, that is less of an issue. There is a lot of potential in the future. Further, there is indirect impact on conservation as well. It has created a larger population of people interested in conservation.”

Banner image: Flowers of *Lantana camara*. Photo by Alvesgaspar/Wikimedia Commons.