

In this issue

Law, Land, Forests, Farmers

Forests occupy less than 22% of land area in India. But in Wayanad district it is 37%. A few years ago, tribals and small and marginal farmers on the periphery of the forests found their livelihood threatened by a law that vests the government with the management of their property. Protecting ecologically fragile lands, a global imperative, imperilled the survival of local farmers.

On **page 1459** in this issue, researchers from the Kerala Agricultural University show how scientists solve such ecology versus economy problems, made complex by social, political and legal entanglements.

First they held discussions with various stakeholders – farmers, officials of the forests, agriculture and revenue departments, activists and representatives of NGOs, legal experts, political leaders and workers. They distilled 45 distinct statements and ideas from these discussions and debates.

Combining these into an association matrix, the researchers analysed it through multidimensional scaling, created a concept rating map, assessed the strengths of consensus between different stakeholders and matched the patterns with different groups. Thus, they identified 28 statements/ideas clustered under five different dimensions – ecological, situational, socio-economic, framework and better EFL dimensions.

The researchers demonstrate how logic, tempered with empathy and compassion, can help develop a re-oriented concept for ecologically fragile lands in Wayanad – adequate for evidence based decision making for lawmakers. The General Article on page 1459 is an example of how scientific temper can resolve even socio-political and legal quagmires.

Mangroves of Maharashtra *Microbiomes matter*

Mangrove ecosystems are unique. Between the land and the sea, bathed periodically with fresh and salty waters, mangroves survive because of the rich network of interdependent organisms – plants, animals, microbes – that stabilise the system.

And then comes the explosive growth of human populations and their insatiable economic needs. Agricultural activities, urbanisation and industrialisation disrupt the delicate balance of the mangrove ecosystem. The impact on the trees that grow there and the changes in the fauna are easily decipherable. What has not been explored is the impact on the microbes. But with the rapid development of genome sequencing, technologies can now help us assess the impact even on non-culturable species of microbes.

And that is what researchers from the Pune University set out to do. They identified twelve mangrove sites along the coasts of Maharashtra, not protected by laws and rules. They classified the sites as industrial, urban and relatively less impacted by humans. They collected samples from the surface soils and processed them through a battery of experimental protocols to identify the microbes. They compared the diversity of microorganisms including those involved in sulphur, phosphorus and carbon cycles. They find unique species in sites exposed to industrial and urban effluents.

The Research Article on **page 1525** provides baseline data about the microbial diversity of the mangroves on the west coast of India and potential impacts of human activities.

Why some Peaches are Sour *Canopy shape impacts fruit*

Two fruits from the same tree seldom taste the same. While some may have the perfect colour and are bursting with flavour, others could be tart and sour. Usually, peaches plucked from the lower branches are less palatable compared to those that ripen on top of the canopy where there is abundant sunshine.

The balance between sunshine and shade can influence photosynthetic activity and thereby impact fruit size and fruit skin colour besides flavour. So, plant breeders have now started manipulating plant architecture to ensure optimal sunlight distribution within the tree canopy. For peaches, which require more sunshine than other plants, breeders usually use four training systems to achieve different canopy shapes:

Y-shaped, Espalier, Hedge row, and V-shaped.

Now a group of scientists from the Punjab Agricultural University, Ludhiana have determined both the sunlight distribution within these canopy types and its effect on fruit quality, shape and size. In a Research Communication on **page 1562** they reveal how the interplay of light and shadow affects fruit flavour, shape, firmness, quality and your overall fruit eating experience.

A New Breed of Refrigerant *And four generations of revolution*

Much of the cooling efficiency of air conditioners and refrigerators is dependant on a suitable refrigerant as they help cycle heat from the hotter inner chambers to the exterior of an AC or a refrigerator. From the early 1900s onwards, different classes of compounds have been utilised for this purpose, but none have emerged as an ideal alternative.

The first-generation coolants were toxic and had to be replaced with chlorofluorocarbons (CFCs) discovered during the end of the World War II. While CFCs are non-toxic, non-inflammable and completely unreactive, they emerged the biggest threat to the atmospheric ozone layer. Because these compounds do not decay easily, survive in the atmosphere for long periods of time, during which they migrate to the upper atmosphere. Here they react with the ozone, creating a hole in this protective shield.

After the discovery of the ozone hole in 1985, the use of CFCs was phased out methodically. But now the world needed a new refrigerant, leading to more innovations in this sector. Recently, a new compound HFO 1234yf has been added to the breed of refrigerants. Could this molecule overcome the pitfalls of the previous coolants?

On **page 1497** in this issue, Pinklesh Arora, Geetha Seshadri and Ajay Kumar Tyagi from the Shriram Institute for Industrial Research, Delhi trace the history of different generations of coolants and provide a comprehensive review of HFO 1234yf – its properties, advantages and usability.

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