

In this issue

Undernutrition in India

Undermining development efforts?

In 2019, India was ranked 102 among 117 nations by the Global Hunger Index based on indices such as stunting, wasting, underweight and mortality among children under five. Stunting affects 46.6 million Indian children, undermining attempts at leveraging on population dividend to improve national productivity and economic growth. In spite of the plethora of policies, plans and programmes initiated by the Government in the last five decades to improve maternal and child nutrition, India may fall short of achieving the related Sustainable Development Goals of the UN.

In a General Article in this issue, researchers from the ICAR-Central Institute of Fisheries Technology, Kochi explore ways to surmount roadblocks on India's path to development. Decision makers at national, state, district and block levels need to consider and take action on their recommendations to overcome undernutrition. Turn to **page 613** for details.

Agrobiodiversity

Ecological farming for economy

The need to feed an ever-burgeoning population has kept Indian agriculture on the path of higher productivity using high-yielding varieties and breeds, chemical fertilisers and pesticides. Thus, though India is now the largest exporter of Basmati rice, the country is slowly losing its richness and heritage of more than 15,000 landraces of rice.

And it is not rice alone. All major crops are losing diversity vital for stable and sustainable food production. The flurry of policies, programmes and promulgation of Acts have not yet helped preclude this propensity for short-term perspective in Indian agriculture.

A General Article in this issue examines the roots of this problem from national and international perspectives and suggests ways to conserve the biodiversity of crops, animals, birds and insects for ecologically sound and eco-

nomically viable agriculture. On **page 607** you will find important recommendations for farmers, farmer organisations and policy makers to make Indian agriculture sustainable.

Microbial Resource Centres

Vision, visibility, viability

Until recently, only culturable microorganisms could be authentically identified. But, due to developments in culture independent DNA sequencing technologies, it has become possible to document and appreciate the actual microbial biodiversity of any ecosystem. Besides the few viruses, bacteria, fungi and protozoa that are pathogenic to humans, animals and crops, there are a large number of microbes that are necessary for our day-to-day existence, useful in agriculture, medicine and scientific research. The potential for discovering and leveraging on microbes for industrial and environmental applications has also, therefore, multiplied in recent decades.

India, with its rich diversity of agroclimatic conditions, is a storehouse of microbes that are not yet documented. The synergy of information technology and biotechnology can be used to create intellectual property at unprecedented rates. To achieve this, we need to set up Microbial Resource Centres in different parts of the country to collect, identify and develop protocols for culturing as yet uncultured microbes – first steps in preserving, conserving and researching to repurpose microbial properties for prosperity.

Based on the experience of setting up and using the National Centre for Microbial Resource, researchers from the National Centre for Cell Science, Pune examine the feasibility of such centres and spell out the myopic elements in society that block the realising of the vision, especially in terms of visibility and viability. See the Research Account on **page 625** in this issue.

Tussling with Titanium Minerals

Tweaking the technology

All along the east coast of India, there are placer minerals – red coloured

sediments, quartz, ilmenite, sillimanite, zircon, monazite, rutile and other minerals. Ilmenite and rutile contain titanium, a light but strong metal with a wide range of industrial applications.

To recover this economically important metal from the badlands, the red soil is scrubbed, deslimed and passed through gravity spirals to separate the heavy minerals. Then, to recover ilmenite and rutile, high electrostatic fields can be used. But there are parameters such as particle size, electrode position, drum speed, temperature of the feed and feed rate that influence the yield. There is also the possibility of improving the yield by using two electrodes instead of one. Experimental methods to optimise the processes are time consuming and require extraordinary efforts. So, four scientists, from four different premier institutions in India, came together to crack the problem. They decided to use the response surface methodology with the Box–Behnken design to cut to the chase.

They processed the red sediment from a village in Odisha to recover a 98% heavy mineral grade sample. Then they used single electrode and double electrode high tension separation to recover the titanium minerals. Keeping feed rate and temperature constant they varied roller speed. The optimum conditions obtained from experimental design and software were then compared. The predicted data matched closely with those from experiments. Thus the operations can now be informed by the model.

The results were unanimous on the electrodes: yield and grade of the recovery of titanium minerals improve by the double-electrode high tension separator.

A small step in the development of technologies, but a big leap in the economics of mineral beneficiation. Read on from the Research Communication on **page 695** in this issue.

K. P. Madhu

Science Writing Consultant

scienceandmediaworkshops@gmail.com