

In this issue

Agriculture Extension Services

A need for convergence

India had to depend on imports from other countries to feed its citizens in the 1960s. But, by the early 2000s, the country became self-sufficient in food grain production and, now, there is even a surplus for export. All this, while the population was burgeoning. This success story is not merely because of advances in agricultural science and technology, but also due to efforts in agricultural extension taking results from laboratories to land.

But India cannot afford to rest on its laurels. The vagaries of weather and changes in climate can threaten agricultural productivity and food security. In spite of the expansion of extension services, most marginal farmers do not have adequate access to agricultural extension services. There has to be a concerted effort to converge the efforts and resources of the Government, NGOs and the private sector to extend the outreach to farmers with less than two hectares of land, who constitute more than 85 per cent of the farming sector.

A General Article in this issue spells out the way forward. Young agriculturists and older decision makers as well as other stakeholders need to read the article on **page 264**.

Nutrition Security in India

By biofortifying cereals

An increase in agricultural productivity in India has improved food security. But the challenge of nutritional security remains. Deficiencies in essential minerals and vitamins impact the health of Indian citizens. A major part of this 'hidden hunger' can easily be overcome by biofortifying cereals, the staple diet of the population.

A Review Article in this issue examines the methods used to identify the donor lines and the breeding programmes for cereals with higher nutritional value as well as the scientific strategies for evaluating such cultivars. After evaluation, the ICAR releases the new varieties for use by farmers. Examples of such re-

leases of rice, wheat, maize, pearl millet and sorghum along with their nutritional advantages in terms of iron, zinc, protein and vitamin A contents are summarised in the article.

The article also assesses the impact of the biofortified cereals on the populations that consume them and explores ways to scale up activities related to nutritional security in the country. On **page 271**, you will find more food for thought.

Draught Animal Density

Mechanisation in Madhya Pradesh

Draught animals were an important factor in agriculture – a necessity for farmers from ploughing to transporting produce to the market. But farm mechanisation, especially the introduction of tractors, changed all that. The population of draught animals has been falling, slowly and steadily. But even today, draught animals play a major role in Indian agriculture.

What are the factors that influence the retention of draught animals in an area?

A Research Communication in this issue examines the case across fifty-one districts in Madhya Pradesh. One-fifth of the cultivated area in the state depends primarily on draught animals.

Armed with data from the livestock census, land use classification and forest surveys, researchers from the Central Institute of Agricultural Engineering, Bhopal investigated the spatial variability in draught animals. While, in some districts, there was a drastic drop in the use of animal power from 2012, in other districts, it remained stationary and, in yet others, the number of draught animals actually increased!

Using the data, the researchers created a model to predict draught animal density over 5500 grid points in the state. Read on from **page 488** to understand how landforms, tractors and forests impact the draught animal population.

Homi Bhabha's Dream

Transforming to reality

Homi Bhabha was a visionary who could foresee that post-independent India's

development depended on energy. A country with inadequate conventional energy resources, India needed to explore atomic energy. Homi Bhabha's tireless endeavour to set up systems for the growth of research and development in the field of atomic energy in India is slowly bearing fruit.

A Special Section in this issue examines the transformation of Bhabha's dreams into reality by scientists and researchers who came later. The articles cover various facets of this transformation. One strand of the progress is, obviously, from the exploration and exploitation of mineral resources needed for atomic energy, to become self-sufficient in manufacturing nuclear fuels, to the development of nuclear power plants, including electronics for instrumentation and control systems as well as methods for spent fuel reprocessing and waste management. India today produces more than enough heavy water and has become an exporter. Along with this, India could master the issues of nuclear safety also.

Another strand of this transformation had an impact on agriculture: many crop varieties developed with the help of radiation are used by farmers today. Radioisotopes and radiation technology used in industry and healthcare is yet another example.

From fabricating components for detectors using materials bought from scrap markets, India has progressed to contributing to large facilities in India and the international arena of science and technology for synchrotrons and particle accelerators. India's contribution to CERN is perhaps the most recognised amongst them.

To achieve this transformation and flowering, Bhabha had sown yet another seed – a Training School that evolved into the Homi Bhabha National Institute, serving the manpower needs of the future.

Read more in the articles under the special section from **pages 278–460**.

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