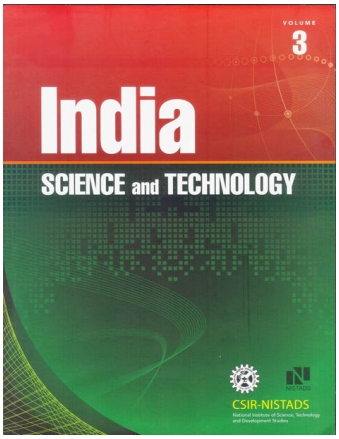

India: Science and Technology, Vol. 3. Sanjib Pohit, Kavita Mehta and Parthasarathi Banerjee (Editorial Coordination). Foundation Books, Imprint of Cambridge University Press, India, Cambridge House, 4381/4, Ansari Road, Daryaganj, New Delhi 110 002 and CSIR-National Institute of Science, Technology and Developmental Studies, New Delhi. 2015. lxii + 538 pp. Price not mentioned. ISBN 978-93-84463-04-5.

As the diversity and number of practitioners in a field increase, data relating to the nature of activity, quantity, quality and impact of the activities of practitioners and on society in general also increase multifold. This brings in the need of data analysis so that trends can be surmised for the benefit of practitioners, general public as well as the policy-makers.

In the present compilation, which is third in the series, the CSIR-National Institute of Science, Technology and Developmental Studies (NISTADS) has collected data for a period of 10 years or so preceding 2012, that relate to various aspects of science, technology, innovation and development. These include S&T manpower training and usage, outputs and implications of the various S&T activities in the country. The enormously large and varied data that have been collected from a large number of primary and secondary sources have been analysed and presented under four major themes: S&T human resource, S&T and industry, S&T outputs, and rural India: S&T for skills and employment. Each of these sections is comprised of large numbers of chapters by different authors on specific issues. The book includes an extensive summary, tables, figures and boxes, references and a short index.

The book is stated to focus 'on the state of affairs in India through the lens of employment generation, upgradation of skills and several dimensions of the Indian science, technology and innovation (STI)', which may help the policy-makers who face the paradox of STI having the potential of new avenues of economic growth and revenue which is often accompanied by displacement of labour because of increased automation. The ever-increasing manpower, unemployment and economic disparity make this a major issue for the policy-makers to resolve.

This book includes a large number of datasets spanning a wide range of issues related to STI in India. It would be impossible to cover the range of issues presented in this volume. Therefore, to illustrate the nature of data considered and the implications for policy-makers as well as for practising STI personnel, I would consider only a couple of issues.

The human resource in the field of STI in India is of great importance since the country has the potential to contribute maximally to the global youth population and, therefore, its patterns of growth, quality of training and preparedness and future trends are of global concern to policy-makers as well as the society in general. Among the diverse issues considered under human resources, the inferences based on analyses of the data pertaining to education at school and post-school higher education, privatization of education, scope and extent of non-formal education, migration, etc. are important. The data presented in this book confirm that the country needs to worry about the quality and preparedness of the youth for productive and challenging S&T activities. We learn from the data that compared to 1.3% of GDP being spent on education in 1990–91, that in 2009–10 was 4.4% and that the gross enrolment ratio (GER) at elementary school level in 2011 was 83%. While this GER is comparable to countries like USA, the UK, China, etc, the enrolment at Master's and doctoral levels precipitously falls to 12.26% and 0.79% respectively. Such a poor enrolment at higher education ranks India low among the other emerging economies. Moreover, science stream is becoming less preferred (18.64% in 2011–12). The data also reveal that in 2010–11 only 0.56% of the GDP was spent on higher education, while the number of universities and deemed universities which share this expenditure has steadily increased since 2001. When further adjusted for inflation, the amount available per university has really not increased much. This is reflected in the decreasing quality of education. With a view to improve the quality of education, privatization has been introduced. The expectation that privatization of education for profit would increase competitiveness and quality has not really materialized, possibly because of poor quality control. Data also indicate that the high cost of education at diverse levels and in various disciplines in private institutions has restricted their accessibility to a limited segment of society.

Data reveal that in the non-formal education sector, in spite of substantial increase in public and private Industrial Training Institutes, only about 14 lakh persons could be trained in 2012–13 against a target of 85 lakhs. With a steep decline in hereditary training in different skills, there is indeed a further shortfall in skilled manpower. A point is made that hereditary training mode 'constitutes a very important, distributed and on the job skill development and education at no public cost' and therefore 'adequate legal and institutional arrangements be made for certification and portability of such hereditary instructions'. The data also bring out that discipline-wise capacity building has not kept pace with the actual job requirements so that there is a significant shortfall in several areas, including the medical infrastructure. Similarly, while 52% of Indian population is dependent upon agriculture for livelihood, only 0.6% of the students study agriculture and allied subjects.

India ranks second or third among countries that 'export' human resource to other countries. Data reveal that the persons of Indian origin (PIO) have acquired better S&T expertise, are financially better-off and have good negotiating skills through better networks. In spite of this large emigrant population that has integrated itself in the global knowledge and economic production, the country does not have any policy relating either to the seasonal flow of migrants or to protect their interests through global negotiations about domestic laws as well as certification and portability of their academic degrees.

The impact of S&T outputs indicates the country's capacity and capability and

its relative ranking in global perspective. Extensive data have been provided with respect to growth of research publications during the last decade in peer-reviewed journals in different disciplines, their citation impact, number of active researchers, national and international patents, industrial designs, etc. Data reveal large increase in absolute numbers as well as relative contributions (in global perspective) in research publications from India, with only a few states in the country contributing more than 75% of research paper output. While India's share of global publications in 2010–11 was 3% compared to 1.9% during 2000–05, the share of highly cited papers increased from 0.3% in 2000 to 0.6% in 2011. Although an analysis based on Indian Science Abstracts shows agriculture to be the dominant research output field during 2005–2009, a similar analysis of the SCI-E database during the same period reveals the Indian contribution in agriculture to be much lower in global perspective. Similar trends are seen in mathematics, suggesting that many of the published research papers do not meet the internationally accepted quality.

While the number of researchers in the country is increasing, data on the number of active researchers, i.e. those with sustained scientific publication record, suggest high drop-out rates. Likewise the age profile of scientists working in India when compared with PIO also appears less favourable. The large number of PIO with excellent S&T credentials contrasts with limited performance of majority of those continuing in the country.

An analysis of the newspaper coverage of S&T developments, which has a strong potential in developing informed public awareness and involvement in national issues, reveals that possible negative consequences of technologies or environmental health issues, ethical–legal issues, or issues relating to patentability, regulations or standards, etc. are hardly discussed.

An increasing trend in the national as well as the US patents has been accompanied by a substantial increase in the base of inventors and assignees. However, most of the Indian patents appear to be in areas where the underlying science is already known. It is suggested that better organic linkages between R&D, university and industry would promote long-term research collaboration and permit the industry to appreciate the necessity and complexities of fundamental research and the time-lag between a discovery and its application and delivery. This would also let the scientists appreciate the realities of commercial production with a greater sense of timeliness, accountability and deliverables. Without such partnerships and mutual realizations, mere streamlining of IPR in universities may not really boost industry–academia interactions.

A serious limitation of the present data analyses is the lack of integration between the large numbers of chapters dealing with similar or inter-related issues. For example, the research publications as indexed in SCOPUS and in ISI-WOK are discussed completely independently, without any crosstalk. The output and utility of the various datasets and their analyses would certainly have been significantly more informative and useful to readers/policy-makers if the editors and authors had attempted integration. The other limitation is the varying time periods for which the different sets of data have been examined in different chapters. This limits not only integration, but also precludes meaningful comparisons. The Index provided at the end is limited and therefore, is of limited value to a reader seeking data pertaining to a specific issue. The relatively few typos and grammatical errors could also have been avoided with a little more care.

The book is a rich source of data and their analyses and would obviously be of wide use, especially for policy-makers and analysts in various fields. Others who may be interested in seeking information on limited scale would also find this compilation useful.

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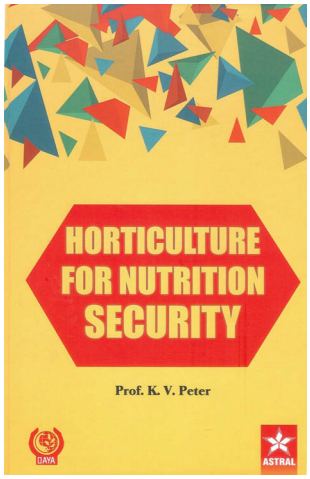

Horticulture for Nutrition Security. K. V. Peter (ed.). Daya Publishing House, A Division of Astral International Pvt. Ltd, 4760-61/23, Ansari Road, Darya Ganj, New Delhi 110 002. 2015. lxiii + 478 pp. Price: Rs 2995.

The book under review is an edited book with 4 preambles and 21 papers each referred to as a chapter. A few of the preambles and articles are not relevant to nutrition security through the consumption of vegetables and fruits. In the introduction, the editor refers to the three 'As' (*availability* of food, *access* to food and *absorption* of the ingested food) which ensure the food security at the individual household level. In his foreword, V. L. Chopra observes that vegetables and fruits which are rich sources of micronutrients (iron, iodine, zinc, vitamin A, vitamin B complex, vitamin D, etc.) are not consumed in the minimum recommended quantities on *per capita* basis in India. Therefore, the primary issues for discussion in the book should have been the pathways to enhance both the 'availability' and the 'access'. Unfortunately, none of the preambles and the chapters elaborates the means to achieve the goal. Chopra also refers to Swaminathan's concept of 'providing a horticultural remedy for every nutritional malady'; unfortunately, the book has little to do with it. As it stands, the book is a collection of assorted articles chosen by the authors in their own domain of expertise. The preamble I (Food and Agriculture Organization of the United Nations) 'The state of food and agriculture 2014 in brief: Innovation in family farming' and the preamble II (Micro-nutrient security for India: Priorities for research and action – Report by