Anyone who has visited India two or three times in the last decade cannot fail to be impressed by the huge economic progress made in recent years.

Dual carriageways and regular flights now link most major cities and traffic becomes more frenetic by the day, as new cars, motor cycles and lorries crowd onto the congested roads.

This is a reflection not just of economic activity, but of increasing affluence, especially amongst an expanding middle class, whose spending power provides benefits throughout the country. India is now a major global power.

Although the population continues to increase there is evidence that the rate is decreasing with the latest census showing a drop in the number of under 20s in all communities (3).

Such an effect would be expected if the trends observed in other countries are followed, where increased economic activity and education are associated with reduced overall birth rates. In India, the trend is also encouraged by government policy.

There are of course great challenges. India still has a large number of cultural, linguistic and ancestral communities whose interests need to be recognized and supported in a changing country, where their needs may not always be met by vigorous pursuit of a market economy.

As pointed out by Frape (this issue) 40% of India's land area is devoted to arable production for food to meet the nutritional requirements of the growing population. About 24% of the land area is forest (2) and 9% is managed as national park or wildlife sanctuary.

These areas are a vital buffer to preserve India's wildlife and preserve iconic species such as the threatened tiger and the Asian lion.

The population of the latter is increasing in the Gir Forest in Gujarat, thanks to the skilful management of the Gujarat Forest Service in cooperation with the National Parks Service and local communities. Likewise, Siriska wildlife sanctuary in Rajasthan, a semi-arid state, has been repopulated with Bengal tigers.

This is a success story of tiger conservation in an area where large scale human interference had eliminated them.

Open wildlife sanctuaries also play an important role in conservation.

For example, the Bisnoi community in north India protect wildlife in their agricultural fields and conserve many species including black buck (a rare antelope). Sanctuaries of this type are an important component of protection for flora and fauna.

As in all countries, the challenge is to maintain food production from a decreasing land area whilst preserving territory for biodiversity when an increasing middle class requires greater attention be given to wilderness preservation and wildlife sanctuaries.

Returning European visitors to India's wildlife sanctuaries and national parks will have noticed how, in recent years, numbers of Indian visitors have overtaken those from other countries; a sign of increasing concern for conservation as well as increasing affluence in India itself.

These changes are all likely to be influenced by the challenges of climate change. Unseasonal variation in the usually predictable climate of northern India seems to be especially serious this year. After two years of low monsoon rainfall, a warm and dry winter has reduced plantings of the essential winter crops of rice and oilseeds by over 4%, and by 7% for wheat alone (3). These figures represent a significant shortfall in production.

Temperature rises, rainfall changes and sea level rises have already affected India to a significant extent since the 1950s, compounding an already variable climate.

The 5th IPCC report (4) indicates that these trends will continue so there will be increased risk of flooding with more variable rainfall and increased temperatures which will reduce yields of rice and wheat in particular.

This puts India at the forefront of global challenges for adaptation to climate change and the need to adopt new agricultural technology to increase yield per unit area and thus production efficiency.

Cotton is an excellent example of this, where adoption of GM cultivars in recent years has increased productivity by 55% since 2000 and increased farmer profits by 50% (6).

Murphy (1) identifies other crops which have the potential to effect similar yield improvements. Adequate field testing of these will be essential if their potential is to be realised, according to a leading crop scientist, M S Swaminathan (7).

The environmental lobby however, considers GM crops to be unsafe for the human and animal consumption (despite much evidence to the contrary), and not sustainable in the long term. They claim the quality of GM foods is inferior to so called natural foods. They also claim repeated application of the same herbicide reduces biodiversity and stability of the ecosystem. Small scale farmers, especially in marginal areas contribute significantly to Indian agriculture.

With changing climate and increased risk of crops failures, these farmers are less likely to afford the high seed cost of new crops and rely on farm saved seed. They frequently have one or two buffaloes, cows or goats which provide resilience in times of crop failures. This small scale agriculture, so important in India, relies on diversity of foods from a small area of land and may well be more resilient in times of unpredictable weather.

The Indian civilization has survived for thousands of years and developed on the basis of a rich cultural tradition to become a global powerhouse.

The nation demonstrates the challenges facing the globe, as societies increase in affluence they become more conscious of their heritage. Historically, such resilience has helped India survive prolonged famines and human invasions; the rich heritage and diversity of plants and animals helped man to survive.

Articles in recent issues of **World Agriculture** and planned for our next issue highlight how India can meet these challenges with confidence.

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18th June 2016

Comments

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