Setting electricity generation targets: some concerns

Rethinaraj and Ahuja[1] (hereinafter RA), have proposed 'optimal targets' for per capita electricity use. In 1985, Goldemberg *et al.*[2] (hereinafter GJRW) proposed that a target of 1840 kWh per capita per annum for electricity use would be adequate to ensure basic human comfort in the developing countries. Quoting GJRW, RA opine that with current efficiency improvements and appliance standards, 1840 kWh per capita per annum should provide more than what was envisaged by GJRW. The figure arrived at by GJRW based on a thought experiment needs analysis and its extrapolation by RA is erroneous. GJRW list activities to be pursued by a person living in the developing world, and have come up with a figure of 1.049 kW (about 33 GJ per annum) per capita as the total final energy requirement. In the list of activities, they have not included space conditioning, appliances other than refrigerators and washing machines, communication, cold-storage requirements, etc. According to GJRW, human needs in the North and the South are different due to 'different cultural aspirations'. The ground reality in India is characterized by rising sale of air-conditioners and a variety of domestic electrical appliances, a growing demand for cold-storage space to provide remunerative prices to farmers for their produce, increasing penetration of communication devices, and globalization of cultural aspirations. GJRW recognize this when they write that the value of their thought experiment would be less if the activity levels turn out to be different from their assumption.

Extrapolation of GJRW's target by RA overlooks two facts. As electricity is the most convenient form of energy from the point of end-use, its share in the final consumption has risen and is projected to rise further[3]. Estimates by GJRW about the fraction of electricity in the total final consumption are consistent with the situation in 1985, and need to be revised significantly upwards. Another fact that has been overlooked is the 'rebound effect', which refers to the reduction in expected gains from new technologies that increase the efficiency of resource use, because of behavioural or other systemic responses[4]. Essentially the thought experiment of GJRW needs revisiting based on today's reality to come up with an appropriate number.

RA argue that Kerala has been able to achieve a high HDI despite low per capita electricity consumption. It is erroneous to compare the whole of India with one of its states, that also a state where large inward remittances comprise a major fraction of its GDP. Also, Kerala's economy is dominated by the service sector and it meets its requirements of manufactured goods from the rest of the country. One also cannot compare India and Cuba, as the size and structure of the two economies are different. One has to compare India with large countries like China, USA, Indonesia, Pakistan and Brazil, or countries in the tropical neighbourhood and sufficiently large ones such as Bangladesh, Vietnam, Thailand, Myanmar and Malaysia.

Lastly, one needs to recognize that a country's uniqueness plays a role in the energy–growth nexus. The uniqueness of India lies in its large size, high population density, growing urban population, an aspirational large middle class, geopolitical situation requiring a diverse economy that must include manufacturing, services, agriculture, and research and development sectors. In addition, India is now going through, to employ the phrase used by GJRW 'intensive infrastructure-building phase' requiring more energy.

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R. B. GROVER

Homi Bhabha National Institute,
Mumbai 400 094, India
e-mail: rbgrover@hbni.ac.in

When flowering of a species threatens its survival

Flowering occurs once in the life cycle of bamboo, the reason for which is still elusive[1,2]. *Bambusa nutans* is one of the important bamboo species in West Bengal, India and locally known as 'makhla bas'. It is a medium-sized species which is largely cultivated in and around homesteads or farmlands. It grows naturally in North East India, West Bengal and some parts of Bangladesh[3,4]. The species is also commercially cultivated in Thailand. Flowering in this species was reported during 1894–1996, 1979–1980, 1987–1988 and 2008 in India, but there were no reports from West Bengal[4,5]. In general, bamboo exhibits two types of flowering, sporadic and gregarious. Generally gregarious flowering has been observed for this species every 35 years followed by mortality of its clumps. Gregarious flowering in bamboo is an extraordinary phenomenon which can lead to ecological disaster if it occurs in majority of the areas where it grows[1].

In 2006, a bambusetum was established at Uttar Banga Krishi Viswavidyalaya, Pundibari, West Bengal, through funds received under the National Mission on Bamboo Application (NMBA). The region is the terai zone of West Bengal located at 26°19′86″N lat. and 89°23′53″E long. at an elevation of 43 msl with subtropical climate. The aim was to collect, conserve and identify suitable bamboo species for the area as well as supply quality planting materials to the growers. Flowering had initiated in a few clumps during March 2019, and was still continuing during this study

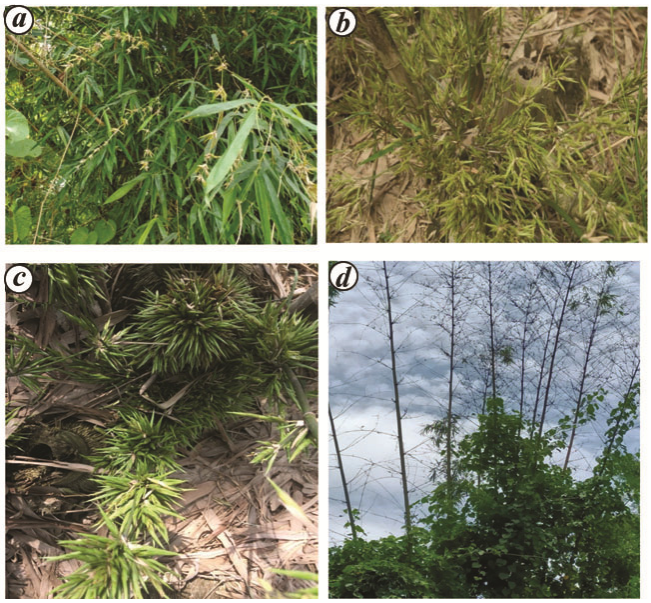

Figure 1. ***a–c***, Flowering in *Bambusa nutans*. ***d***, Drying of clumps.

period (Figure 1 *a–c*). After flowering, 2–3 clumps started drying and finally died within a few months, which were then warped by climbers (Figure 1 *d*). In rest of the clumps flowering is continued in some of the branches during the study period. During our repeated visit to the bambusetum, flowering was observed on the branches and also on the ground. However, none of these produced seeds, as no new seedlings were observed in and around the clumps. Flowers of the species were reported producing sterile seeds as also observed in the bambusetum[6]. The species is thus being propagated through vegetative means with below 50% success. Conservation of the species is difficult in natural conditions due to lack of fertile seeds and low rooting in vegetative propagation. The present report thus recommends research efforts to study physiology and breeding principles of *B. nutans* to its conservation through the production of seedlings either by producing fertile seeds or enhancing rooting in the vegetative propagules.

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P. SURATH KUMAR[1]
GOPAL SHUKLA[1,*]
VINEETA[1]
PANKAJ PANWAR[2]
SUMIT CHAKRAVARTY[1]

[1]*Department of Forestry, Uttar Banga Krishi Viswavidyalaya, Pundibari 736 165, India*
[2]*ICAR-Indian Institute of Soil and Water Conservation, Research Centre – Chandigarh, Madhya Marg, Chandigarh 160 019, India*
**e-mail: gopalshukla12@gmail.com*

Locusts plague: an emerging threat to India

While India is still battling with the health and economic crises due to the COVID-19 pandemic, an emerging threat in the form of invasion by locusts might further jeopardize the food security and agricultural economy of the country. Locusts, the oldest global migratory pests, have been dreaded in the past and are devastating even today. They sometimes display a solitary lifestyle of a grasshopper (Acridoidea); however, under favourable environmental conditions – moist soil and sprouting vegetation after heavy showers – locusts gregarize and form enormous swarms of ~1 km^2 size[1]. An average swarm of 40 million voracious locusts can migrate over large distances, even spreading across regions, and cause serious agricultural damage by devouring crops enough to feed about 35,000 people in a day[2]. This year the threat is due to the desert locust *Schistocerca gregaria*, the most notorious and devastating locust species.

Desert locusts directly threaten the food security of a country, besides livelihoods, environment, and economic development[3]. The world is facing one of the worst locust plagues in decades, with maturing populations of desert locusts along the southwestern coastal plains of Iran and Sistan Baluchistan region[4]. While the threats are increasing in Southwest Asia and the Sahel, by May 2020 FAO had appealed for USD 311.6 million to curb the locust storm in the Horn of Africa, and Yemen. Experts suggested that the change in cyclonic patterns over the Arabian Sea has caused the recent locust invasions in East Africa and Southwest Asia[5]. In February 2020, Pakistan declared the locust infestation as a 'national emergency' given its harrowing impacts on food security in terms of the loss of 40% of its food crops[5]. Soon, the Ministry of Environment, Forests, and Climate Change (MoEFCC), Government of India reported that the locust swarm had entered the country from Pakistan (Figure 1). This outbreak has been causing major damage to standing cotton crops and vegetables in the Central and western states of India, including Rajasthan, Punjab, Haryana and